SOILS AND FERTILIZERS

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RECENT STUDIES IN POTASSIUM FIXATION

Work since 1939 on K fixation has been concerned mainly with the following aspects: fixation and soil-moisture content, the role of clay minerals, fixation and the exchange complex, fixation as an equilibrium process and, to a lesser extent, fixation as affected by humus and soil reaction. "Fixed K" is commonly taken to mean that which is only moderately rapidly available to plants, as distinguished from (a) the readily available fraction, including exchangeable K, water-soluble K salts and K in inorganic matter and (b) that which becomes available only very slowly, including the K of feldspar and muscovite. Attoe and Truog(1) for example record that the non-exchangeable K extracted with 0.5 n. HCl at room temperature —amounting to quantities up to 90% of those extracted in the exchangeable form—was moderately available to plants, while in some soils the benefits of fixation may largely counterbalance the disadvantages of slower availability(2).

Soil moisture. Drying of soil

Raney and Hoover(3) showed that 23 per cent of the 2160 p.p.m. of K applied to a montmorillonitic soil became fixed during 1 month of moist storage, and that 57 per cent became fixed on subsequent air-drying. With a kaolinitic soil, moist fixation was much smaller, while air-drying appeared to release some of the fixed K to the exchangeable form. In light soils responsive to applied K, air-drying distinctly increased the fixation of applied K, but had little effect on the native soil K. Subsequent wetting caused a slow release into solution or into the exchangeable form(4), while saturation with moisture of Mississippi-delta soils, high in K, markedly increased the exchangeable-K content(5). Walsh and Cullinan(6) also showed that fixation by alternate wetting and drying was not permanent: it was, however, large enough to cause severe K-deficiency symptoms in a first crop of mustard in pots, while the growth of a second crop indicated a release of K from the fixed state.

Attoe(7) concluded that fixation is of two kinds: (a) that which proceeds in moist soil, increases with pH and fixes K in a form fairly soluble in 0.5 n. HCl, and (b) that which proceeds on drying, is independent of pH and fixes K in a form fairly resistant to extraction with 0.5 n. HCl. In some soils, unfertilized with K, drying caused an increase in exchangeable-K content. Attoe and Truog(1) suggest that the drying fixation of applied exchangeable K follows a definite law expressed in the equation $\log Y = k \log X + c$, in which X is the rate of application, Y the amount remaining exchangeable of that applied, and k and c are constants determined by the extent of fixation.

Ayres(8, 9), using K salts at concentrations between 0.1 n. and 0.001 n. on acid soils, showed that the concentration of the percolating K solution is an important factor in fixation, and concluded that for any given soil there is a concentration, of K applied in solution, below which sorption does not occur; thus the use of small amounts of K fertilizers in irrigation water may result in loss of the nutrient by leaching. Hauser(10) obtained evidence of a critical moisture content of the soil below which K could not enter the lattice of the clay crystals. Martin *et al.*(11), while noting that the greatest fixation occurred on drying at high temperature, believe that the results do not suggest that a dehydration is directly involved: the effect noted on drying may be due to an increased concentration of salts in the soil. Wood and DeTurk(2) recorded that, in a mature Illinois soil, heavy K applications became fixed in an acid-insoluble form, while in a younger soil the acid-soluble form became greatly increased.

Clay minerals

Volk(12) recorded that a powdered pure kaolinite fixed 440 p.p.m. of K, muscovites from 0-1700 and a bentonite 8850 p.p.m. Jacob(13) ascribed the very strong fixation in tropical soils to montmorillonite, and Hauser(10) reported of a variety of Dutch

soils that mica minerals were the most strongly fixing. Seatz and Winters(14) also confirmed the great fixing power of mica and montmorillonite types. Stanford(27) reported that micaceous minerals are responsible for rapid moist fixation in calcareous soils, owing to the fact that Ca, Mg and Na are quite readily replaced by K. The fixation is an exchange reaction. Acid illite under moist conditions, however, fixes only fairly small quantities unless NaOH, $Ca(OH)_2$, phosphate, fluoride, etc., are used to remove (by an exchange reaction) H, Fe and Al ions from the intramicellar spaces. With the exception of fluoride, these treatments reduced the drying fixation in bentonite, probably through a blocking of exchange positions of interplanar surfaces. Martin *et al.*(11) suggested the possibility that fixation occurs at a limited number of attraction spots having special properties due either to their position in the lattice or to the nature of the soil minerals with which they are associated. Page and Baver(15), in attempting to reconcile different theories, suggested that drying fixation is related to the ionic size of K and the contraction of the montmorillonite lattice: K ions of ionic diameter 2.66A would be strongly held in the spaces, of diameter 2.8A, between the hexagonally arranged oxygen ions. When large ions, such as diethylamine, were used to prevent sheet contraction on drying, K fixation was reduced to one tenth. Univalent and divalent cations of ionic size close to the size of certain free spaces within the lattice were susceptible to fixation. Martin *et al.*(11) emphasize that X-ray diffraction data do not support Page and Baver's lattice-shrinkage theory as a general explanation of the fixation of K in non-replaceable form.

eThe xchange complex

Joffe and Levine in a series of papers (16, 17, 18, 19, 20) present evidence that K, in order to become fixed, must take on the exchange state, and Martin *et al.*(11) found strong evidence that certain cations, when present in the exchange complex of some soils, can pass from a loosely held to a very strongly held state, and concluded that K fixation involves an exchange adsorption followed by a fixation resulting in a reduction of the total exchangeable cations of the soil, the transformation possessing many of the characteristics of a chemical reaction: the degree to which it occurs depends on the concentration of the potassium ion in the soil solution and on its amount in the exchange complex, equilibrium is reached rapidly, but the reaction is only very slowly reversible. Wood and DeTurk(2) noted that additions of K_2HPO_4 gave twice the replaceable-K content given by additions of KCl, and concluded that new exchange positions were formed independently by the PO_4 linkage without disturbing the native exchange valencies. Seatz and Winters(14), studying the relationship between fixation, exchange capacity and the complementary ion, suggested that the exchangeable K is in equilibrium with the K-bearing soil minerals and that when the degree of K saturation of the colloids is altered by fertilizing or cropping, K tends to be respectively fixed or released. 7 soils, for example, appeared to have an equilibrium level near the 400-lb. rate of application (220 p.p.m.). In 2 soils of the same colloid content and exchange capacity, fixation was greater in the one with a higher proportion of mica and montmorillonite. In 14 Mississippi-delta soils, an increase in base saturation was associated with an increase in fixation until complete saturation was reached, after which a decrease in fixation ensued(5).

Equilibrium and release

Wood and DeTurk(2, 21) established that on some Illinois soils K applied in heavy dressings became fixed in a fairly insoluble form, but became exchangeable again as the soils were depleted of exchangeable K. The replaceable, acid-soluble and acid-insoluble forms were in a slowly shifting equilibrium, shifts obeying the law of mass action. In experiments in Iowa(22) the existence of an equilibrium was indicated by the close correlation between (a) the K released to the exchangeable form after this form had been removed by leaching and (b) the original replaceable-K content of the soil. Release was greatest from heavy alluvial soils, and greater from soils under grass than under forest.

A montmorillonitic soil showed(3) a temporary equilibrium between exchangeable and non-exchangeable K within a week after leaching with neutral ammonium acetate,

with a second level of equilibrium in a month, whereas in a kaolinitic soil only one level of equilibrium occurred, within 1 and 2 weeks after leaching. Recent studies of the release of fixed K to an exchangeable or a non-exchangeable but plant-available form are those of Chandler *et al.*[23] who noted, in 11 soils continuously cropped with clover, an initially rapid and then slow decrease of the exchangeable-K content to an equilibrium determined by the rate of release from the fixed form, this rate being high in 4 and low in 3 soils; and of Ayres *et al.*[24] who noted in Hawaiian soils under Napier grass a release of 3400-4200 lb. of K_2O per acre in $4\frac{1}{2}$ years from non-exchangeable sources, with little corresponding decrease in the level of exchangeable K.

The rate of release from Ca-saturated soils was only one half of the rate in H-saturated soils, which, it is suggested, may explain the occurrence of K deficiency in high-lime areas[22]. Ayres[8, 9] noted that an increasing degree of Ca saturation in acid soils increased the desirable sorption of and prevented the loss of K from solutions of low concentration. Joffe and Levine[18] referred the increased fixation which generally follows liming not to the Ca, but to the higher pH and consequent effect on the relative base saturation of the exchange complex. Raney and Hoover [3] reported that Ca-saturated soils containing small, medium and large quantities of artificially fixed K released respectively greater, similar or smaller quantities of K into the exchangeable form than the same soils when H-saturated.

Organic matter

Hauser[10] reported that humus soils without clay colloids did not fix K, but that when the humus of mineral soils was oxidized their K-fixing capacities were greatly reduced. Pchelkin[25] found that the oxidation by H_2O_2 of the organic-matter content of chernozems reduced the fixing power of these soils. Martin *et al.*[11], working with arid soils, could not attribute fixation to the presence of organic matter, and Joffe and Levine[18] found that the addition of organic matter depressed fixation. In the Mississippi-delta soils, of pH 5-8, the addition of organic matter markedly increased the leachable and the available K[5], while on fine sandy loams, very responsive to K, added organic matter prevented the fixation of applied K and changed more than 70 p.p.m. of native K from the non-exchangeable to the exchangeable form[4]. A biological fixation in unleachable form of up to 200 lb./acre of K is reported by Hurwitz and Batchelor[26] on adding plant material to a neutral silt loam. Biological activity may thus be of importance in the fixation occurring during moist storage.

W.D.B.

REFERENCES

(1) Attoe, O. J. and Truog, E. Exchangeable and acid-soluble potassium as regards availability and reciprocal relationships. *Proc. Soil Sci. Soc. Amer. 1945*, 10, 1946 (81-86).

(2) Wood, L. K. and DeTurk, E. E. The release of fixed potassium to replaceable or water-soluble forms. *Proc. Soil Sci. Soc. Amer. 1942*, 7, 1943 (148-153).

(3) Raney, W. A. and Hoover, C. D. The release of artificially fixed potassium from a kaolinitic and a montmorillonitic soil. *Proc. Soil Sci. Soc. Amer. 1946*, 11, 1947 (231-237).

(4) Walker, R. K. and Sturgis, M. B. The effects of wetting, drying and treatments on the availability of potassium in soils. *Proc. Assoc. S. Agric. Workers* 41, 1940 (79).

(5) Worsham, W. E. and Sturgis, M. B. Factors affecting the availability of potassium in soils of the lower Mississippi deltas. *Proc. Soil Sci. Soc. Amer. 1941*, 6, 1942 (342-347).

(6) Walsh, T. and Cullinan, S. J. The effect of wetting and drying on potash-fixation in soils. *Emp. J. Expt. Agric.* 13, 1945 (203-212).

(7) Attoe, O. J. Potassium fixation and release in soils occurring under moist and drying conditions. *Proc. Soil Sci. Soc. Amer. 1946*, 11, 1947 (145-149).

(8) Ayres, A. S. Sorption of potassium and ammonium by soils as influenced by concentration and the degree of base saturation. *Soil Sci.* 51, 1941 (265-272).

(9) ——— Sorption of potassium and ammonium by Hawaiian soils. *Hawaii Plant. Rec.* 45, 1941 (93-106).

(10) Hauser, G. F. [Non-exchangeable fixation of potassium in soil.] *Thesis, Wageningen*, 1941, pp. 171. [G.du.]

(11) Martin, J. C.; Overstreet, R. and Hoagland, D. R. Potassium fixation in soils in replaceable and non-replaceable forms in relation to chemical reactions in the soil. *Proc. Soil Sci. Soc. Amer. 1945*, 10, 1946 (94-101).

(12) Volk, G. W. The nature of K fixation in soils. *Soil Sci.* 45, 1938 (263-277).

(13) Jacob, A. [The fixation of fertilizer potash in tropical soils.] *Bodenk. PflErnähr.* 21/22, 1940 (621-629). [G.]

(14) Seatz, L. F. and Winters, E. Potassium release from soils as affected by exchange capacity and complementary ion. *Proc. Soil Sci. Soc. Amer. 1943*, 8, 1944 (150-153).

(15) Page, J. B. and Baver, L. D. Ionic size in relation to fixation of cations by colloidal clay. *Proc. Soil Sci. Soc. Amer. 1939*, 4, 1940 (150-155).

(16) Joffe, J. S. and Levine, A. K. Fixation of potassium in relation to exchange capacity of soils. I. Release of fixed potassium. *Soil Sci.* 62, 1946 (411-420).

(17) ——— ——— II. Association fixation of other cations particularly ammonium. *Soil Sci.* 63, 1947 (151-158).

(18) ——— ——— III. Factors contributing to the fixation process. *Ibid.* (241-247).

(19) ——— ——— IV. Evidence of fixation through the exchange complex. *Ibid.* (329-335).

(20) ——— ——— V. Mechanism of fixation. *Ibid.* (407-416).

(21) Wood, L. K. and DeTurk, E. E. The absorption of potassium in soils in non-replaceable forms. *Proc. Soil Sci. Soc. Amer. 1940*, 5, 1941 (152-161).

(22) Iowa Agricultural Experiment Station. Potassium availability in different soil types and crop response to potassium fertilization. *Iowa Agric. Expt. Sta. Rept. 1945-1946*, Part 1, 1946 (107-109).

(23) Chandler, R. F., Jr., Peech, M. and Chang, C. W. The release of exchangeable and non-exchangeable potassium from different soils upon cropping. *J. Amer. Soc. Agron.* 37, 1945 (709-721).

(24) Ayres, A. S., Takahashi, M. and Kanehiro, Y. Conversion of non-exchangeable potassium to exchangeable forms in a Hawaiian soil. *Proc. Soil Sci. Soc. Amer. 1946*, 11, 1947 (175-181).

(25) Pchelkin, V. U. [Conditions of potassium mobility in non-calcareous soils.] *Pedology* 1946 (604-610). [R.]

(26) Hurwitz, C. and Batchelor, H. W. Studies on biological fixation of potassium. *Soil Sci.* 56, 1943 (371-381).

(27) Stanford, G. Fixation of potassium in soils under moist conditions and on drying in relation to type of clay mineral. *Proc. Soil Sci. Soc. Amer.* 12, *1947*, 1948 (167-171).

THE PETROLOGY AND PETROGRAPHY OF SOUTH AFRICAN CLAYS

(*By V. L. Bosazza. The Author, Johannesburg.* 1948. *pp. xv* + 313. Price £2. 2s.)

This book consists of a thesis for the degree of D.Sc., presented to Natal University College. It gives the impression of being a rather unhappy compromise between a systematic treatise on the nature of clay, and a descriptive work on the clays of South Africa. The numerous chemical, mechanical and petrological analyses are mostly treated as illustrative material for the general thesis, and consequently data on the same or contiguous rock types are liable to be widely scattered in the text. The arrangement defies ready reference, and the index is far from being complete enough to repair this fault. An example of the result of this is given by the data on Boksburg clays. Analyses of typical clays are given on pp.130 and 133 (under the heading Alumina-Silicate Hydrates). For a description and diagram of the geological relationships of these deposits we must turn to p. 250, where they are treated under the heading Deposits of Transported Clays. These references are listed in the index. Also given (but not listed) are: a photomicrograph and description on p. 137; an analysis of a kaolinite aggregate from Boksburg on p. 139; another analysis on p.5; and modulus-of-rupture determinations on pp. 90-91.

The amount of data collected in the present work is important, and includes not only the author's own, but also selections from publications by Van der Merwe (soil analyses), Nel, du Toit and other authors, and many (perhaps too many) comparative data on clays from other countries. Apart from spectrographic results, there is an almost complete absence of data obtained by modern physical methods of investigation (X-ray diffraction, differential-thermal, electron-microscopy), and, as a result, many identifications of clay minerals are tentative. Thus, on the important question of the clay-mineral content of the Dwyka tillite the author can only express his doubt of Gever's identification of montmorillonite, but offers no more definite alternative statement on his own behalf than that "there is at least as much illite present as montmorillonite". Most readers who are acquainted with modern developments of X-ray diffraction technique will surely think that he greatly underestimates its importance (p. 167).

The appearance of scrappiness given by some of the author's data is no doubt due, as he indeed indicates, to the exigencies of the commercial purposes for which they had been collected. It is much to be hoped that he will find time to complete many of his observations, and to write an authoritative work on South African clays.

The book is clearly and legibly reproduced from typescript by the Replika process, but its readability is lessened by numerous errors in the original typescript. The list of general references is voluminous, and indicates a wide acquaintance with the literature of the subject. There will surely be few readers who will not find mentioned in it some papers which they ought to have, but have not, read. The author does not, however, appear to have kept up to date with the literature on Attapulgus clay, for he accepts (pp. 158-9) the now generally discarded idea that it is montmorillonitic.

D. M. C. MacEwan

SUMMARY OF REPORTS

Reports received include: *Australia,* New South Wales Department of Agriculture Report 1946-47; *British Guiana* Department of Agriculture, Field Experiments with Sugar Cane, Variety and Fertilizer Position of the Sugar Industry and Report on Sugar Experiment Stations 1947; *Ceylon* Tea Research Institute Report 1946; Coconut Research Scheme Report for 1945 (published 1948); *Cheshunt* Experimental and Research Station Report 1947; *Colonial Office* Reports on the Cayman Islands, Gibraltar, Hongkong, Seychelles, Turks and Caicos Islands, and Zanzibar 1947; *Gold Coast Colony* Report of Department of Agriculture 1946-47; *Holland,* Verslag van het Centraal Instituut voor Landbouwkundig Onderzoek, Wageningen 1947; Koninklijke Vereeniging Indisch Instituut, Amsterdam, Jaarverslag 1947; *India,* Scientific Reports of the Indian Agricultural Research Institute, New Delhi 1946-47; Institute of Plant Industry, Indore, Report 1946-47; *New Zealand* Department of Agriculture Report 1947-48; *Nigeria* Department of Agriculture Report 1945; *Sarawak* Department of Agriculture Report 1947; *Southern Rhodesia,* Report of the Secretary, Department of Agriculture and Lands 1947; Programme and Progress Report of the Marandellas Pasture Research Station 1947 [included in Rhod. Agric. J. 45, 1948 (255-275)]; *Swaziland* Department of Native Land Settlement Report 1947; *Sweden,* Jordbrukstekniska Institutets Årsberattelse, 1947-48; *Uganda,* Forest Department Report 1947; Geological Survey Department Report 1944; *Zanzibar* Department of Agriculture Report 1947.

Australia.—*New South Wales Department of Agriculture.*—Problems of salinity of citrus soils in Murrumbidgee Irrigation Area. Investigation of fertility decline of red soils of the north coast.

British Guiana.—Manurial trials with P on flood-fallowed frontland, Pegassy clay and flood-fallowed Riverside clay; trials with liming materials on flood-fallowed frontland and with molasses on frontland and Pegassy clay. Cultivation trials.

Ceylon.—*Tea Research Institute.*—Response of tea to K fertilizers. C and N survey of permanent experiments.

Coconut Research Scheme.—Experiments with NPK fertilizers showed highly significant response to N applications in the second year; this declined thereafter. Study of influence of manuring on female flowers and setting of nuts; manuring experiments on young palms and cover crops.

Cheshunt.—*Tomatoes*: Effect of soil sterilization on blotchy ripening of tomatoes. Manurial trials with lime, P and S; effect of NPK and minor elements on *Didymella* stem rot. Relationship between susceptibility to virus infection and the amount of water added to soil. Production of an antibiotic substance in sterilized soil and the effect of sugar-beet pulp on the production of such substance. Introduction into sterilized soil of *Phytophthora patulum* and its effect on control of damping-off of tomato seedlings. Determination of available nutrients in tomato soils and the effect of soil nutrients on the plant. Use of sodium alginate in composts for propagating tomatoes. Nitrification studies; influence of phosphate on nitrification in a slightly acid soil; nitrification at constant temperature; nitrification response to the level of application of fertilizers; preliminary test of N in organic fertilizers.

Gold Coast Colony.—Establishment of two Cocoa Experiment Stations at which trials have been laid down with manures; the effect of $(NH_4)_2SO_4$ on the growth of young seedlings, the effect of soil cultivation and food cropping prior to the planting of cacao, and the use of nurse crops. Reconnaissance soil survey.

Holland.—*Wageningen.*—Pastures: Study of quality resulting from different P and K status, acidity, soil type, humidity and use; wireworm studies; water relationships; improvement by manurial treatment. Weed control in flooded grassland. Yields in different parts of the country and with different fertilizer treatment; trace elements. N fertilizers and climate for cereals. Spacing

trials with maize. Possible production of morphine in the Netherlands. Growth substances, yields and quality of potatoes on sandy and clay soils; weed control in potatoes.

India.—*Indian Agricultural Research Institute.*—Fertilizers and cultivation: Experiments with leys of 2-3 years' duration fertilized with NPK. N manures for wheat and P manures for legumes; tillage and manuring experiments with wheat; green manures fertilized with N and P for wheat production; fertilizer-placement experiments with N, P and K. Comparison of relative values of N in green manure, farmyard manure, compost, oil cake and $(NH_4)_2SO_4$, estimating the recovery of N by the crops and changes in moisture, ammonia and nitrate contents of soils. Effect of introducing a legume in rotation with wheat and maize. Effect of P fertilizers on legumes in building up soil fertility and on the rate curves of solubility of soil phosphates in different solvents. Indicator-plant studies of soil fertility and foliar diagnosis. Examination of P-absorbing power of N-fixing organisms. Manuring and green-manuring experiments with sugar cane and paddy. Rotational and manuring experiments for control of gram wilt. Alkali-control trials by mulching. Micro-nutrient studies: on yields and quality of crops and on tobacco leaf-curl disease, wilt disease of gram and deficiency diseases of citrus; standardization of analytical methods of determining B, Zn and Cu; analysis of content of Co and Mo in plant tissues and soils. Soil survey. Study of colloidal constituents of black cotton soils; investigation on effect of surface colour on plant growth; investigation on pF, permeability and pore-space of soils. Use of opium, opium smoke and *Nicotiana rustica* as insecticides. Experiments with deep ploughing for eradication of *Kans*.

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Institute of Plant Industry, Indore.—Trials with $(NH_4)_2SO_4$, groundnut cake and P fertilizers for cotton. P manuring of leguminous crops preceding cotton. Effect of soaking seed in nutrient solutions. N manurial trials with jowar. Green manuring of irrigated wheat. Manurial trials with wheat, gram and linseed. Eradication of *Kans*.

New Zealand.—Top-dressing trials with fertilizers and lime. Survey of plant response to K and the effect of previous pasture management on response to K. Fertilizer requirements for wheat, linen flax, linseed, lucerne, maize and potatoes. Methods of application and forms of B for control of mottle-heart disease of Brassicas. Times of application of N to potatoes. Effect of burning stubble for cereal crops before ploughing; fertilizer-placement studies; effect of lime on the physical condition of the soil. Use of fertilizers in development of peat soils for pasture; placement of fertilizers. Spray-irrigation and drain-gauge trials. Testing of limestones for carbonate content, fineness of grinding and rate of solution in dilute acid. Rhizobium studies in relation to peat soils. Nitrification studies with soil-perfusion apparatus.

Nigeria.—Reconnaissance soil survey. Fertilizer trials and rotations.

Sarawak.—Application of P fertilizers and lime preceding N fertilizers; placement of P fertilizers. Burning and application of wood ashes as manure and despoiling the jungle for this purpose. Composts, night soil, fish refuse, pig manure and bat guano as manures. Promising results from mechanical cultivation of wet padi.

Southern Rhodesia.—*Department of Agriculture and Lands.*—Fertilizer trials on vlei lands and effect of vlei management and utilization on the soil.

Marandellas Pasture Research Station.—Time and frequency of veld burning in relation to grazing. Fertilizer requirements of established pasture and its effect on beef production. Effects of minor elements on vlei pasture. Soil and water conservation; percolation, runoff and ecological investigations.

Swaziland.—Use of kraal compost and artificial fertilizers.

Zanzibar.—Cloves: Manurial trials with sodaphosphate (silicophosphate) in place of super. which has caused no response from cloves or other crops on typical red soils. Trials with tropical kudzu (*Pueraria phaseo-*

loides) in young clove plantations. Trials with NPK and coconut meal as fertilizer on clove saplings. Rice: Application of compost to rice in the nursery and in the field gave no significant increase in the yield; comparison of effects of fallowing land between rice crops, burning stubble, planting with sweet potatoes or pulse crop, and removal of weed or pulse trash for composting. Trials with NPK, sodaphosphate and lime for maize. Residual effect of sodaphosphate on cowpeas and millet. Preparation of reconnaissance soil maps of Zanzibar Island on scale of ½ inch to 1 mile. Investigations of composition, moisture constants and C/N ratios of cacao soils.

ABSTRACT SECTION

NOTE.—A capital letter in square brackets following the reference denotes the language in which the paper is written. A small letter denotes a summary in another language, e.g. [G.e.]—German, with English summary. English [E.] is only indicated for papers published in journals usually written in foreign languages. Where the Bureau has only seen an abstract, and not the original paper, no language indication is given.

Original (untranslated) titles of papers are only given where the Latin script is used.

Where more than one reference is given, the first is to the original paper, the others to notices in abstract journals. A key to the abbreviations used in the references is contained in the Bureau's *Bibliography of Soil Science, Fertilizers and General Agronomy.*

631.3 AGRICULTURAL EQUIPMENT

[1] 631.312
HAWKINS, J. C. **An introduction to field ploughing.** *Occ. Publ. Sci. Hort.* No. 5, 1947 (40-43). [N.I.A.E. Askham Bryan, Yorks. *now* Silsoe, Beds.]

Plough bodies, plough setting and ploughing technique.

[2] 631.312
REED, I. F. **Disk ploughs and their operation.** *U.S.D.A. Farm. Bull.* 1992, 1948, pp. 10.

Disc ploughs are particularly useful in preparing seedbeds, turning under surface crops and surface debris and controlling soil erosion. Adjustment, operation and care of disc-plough equipment are discussed. Figures are tabulated showing disc-plough draft in sand, sandy loam and clay soils.

[3] 631.312.5
HERRIOT, R. I. **Implements for stubble mulch cultivation.** *S. Aust. J. Dept. Agric.* 52, 1948 (26).

The double disc is the basic implement and should always be used for the initial ploughing, all subsequent cultivation being done with the scarifier. Speed is all important. Disc implements would have been ideal behind a horse team; with tractors it is essential that they should never be driven on cultivation work at more than 3½ miles per hour. The size of disc is important. A 21-inch disc is to be preferred to an 18-inch disc since the larger the disc the more slowly it revolves and even then the breast cut should be adjusted to ensure minimum movement of soil and maximum amount of crop residue left on the surface. The wrong use of disc implements can result in the wrecking of the land.

[4] 631.316
WARE, J. R. **Tractor row-crop hoeing.** *Proc. Instn. Brit. Agric. Engnrs.* 5, No. 1, 1948 (4-15).

Various methods and machines used in the inter-row cultivation of crops, chiefly sugar beet.

[5] 631.347.24
HASEK, R. **New overhead watering method developed for the greenhouse.** *Florists' Exchange* 108, No. 21, 1947 (19). Biol. Abs. 22 (1203). [Ohio St. Univ. Columbus]

A 1-inch or ¾-inch pipe is laid on the soil surface down the centre of the bench. At 15-inch intervals special nozzles are inserted which deliver a fine fan-shaped spray covering the full width of the bench. There is said to be less soil compaction by this system than by the usual overhead watering.

631.4 SOILS

(*See also* Abs. No. 58)

[6] 631.4 : 551.58
OVEY, C. D. **Weather phenomena and related natural effects.** *Weather* 3, 1948 (295-300).

Topics discussed include rain and erosion; rain and crops; wind, scenery and vegetation; effect of frost and fog on soils and crops.

[7] 631.4 : 552.323.5
RETZER, J. L. **Soils developed from basalt in Western Colorado.** *Soil Sci.* 66, 1948 (365-375). [Rocky Mt. Forest and Range Expt. Sta.]

The characteristics of soils developed from basalt under successive climatic-vegetation zones from desert to high spruce forest were

studied at altitudes of 5,000-10,800 feet. Soils with distinctly different characteristics have developed in each zone. Drainage is good in all these soils, which are mostly mature. The thickness of the A horizon increases from 6 to more than 16 inches with increasing altitude. Reaction decreases from pH 8 in the desert to an extreme of 4.5 under spruce above 10,400 feet. Organic matter increases from 1.3% in the desert to 6% on the Grand Mesa. Subsoil development tended towards claypans reaching a maximum development on the mesa. Some soils developed from recent glacial till have not developed clay subsoils.

[8] 631.4 : 552.47 : 546.77
WALKER, R. B. **Molybdenum deficiency in serpentine barren soils.** *Science* 108, 1948 (473-474). [Dept. Bot. Univ. Calif., Berkeley *now* Bot. Dept. Univ. Wash., Seattle]

The presence of Mo deficiency in tomato and lettuce plants grown on three primary serpentine soils from different areas and varying widely in organic-matter content suggests that low available Mo may be a general characteristic of primary soils weathered on serpentine primary material. In addition to probable peculiarities in their Ca/Mg nutrition plant species native to the serpentine barrens may also have low Mo requirements.

631.41 SOIL CHEMISTRY

(*See also* Abs. No. 308)

[9] 631.414.3 : 546.19
BOISCHOT, P.; HÉBERT, J. Fixation des arséniates par le sol. **[Fixation of arsenates by the soil.]** *Ann. Agron.* 18, 1948 (426-448). [F.] [Versailles]

The fixation of As_2O_5 by clay depends on the amount of As introduced into the soil, the duration of the contact, the quality and nature of the ions combined with the clay and the pH.

In an acid medium fixation is much slower than in a neutral or alkaline medium. Fixation by calcareous soils is by adsorption, not by combination. Humus fixes only a small proportion of As_2O_5 in a neutral or alkaline medium. The fixation is proportional to the quantity of humate.

[10] 631.414.3 : 549.623.93
MACEWAN, D. M. C. **Adsorption by montmorillonite, and its relation to surface adsorption.** *Nature* 162, 1948 (935-936). [Rothamsted]

The nature of the forces giving rise to the intra-crystalline swelling of montmorillonite is discussed and 11 references are given.

[11] 631.414.3 : 631.811
MEHLICH, A.; REED, J. F. **Effect of cation-exchange properties of soil on the cation content of plants.** *Soil Sci.* 66, 1948 (289-306). [N.C. Agric. Expt. Sta.]

A fine sandy loam with an exchange capacity of 20.8 mg. eq. was treated to give a constant degree of Ca saturation and three levels each of Mg and K. After analysis and dilution with sand the soil was used for pot cultures of soybeans. When the soybeans had been harvested at the pod-formation stage the soil was re-analysed, treated with $NaNO_3$ and $MnSO_4$ and sown with oats and turnips.

Increasing each exchangeable cation raised the level of that cation in the plant and lowered the levels of other cations except in the case of exchangeable Mg which generally had no significant effect on K and Na contents. The sum of cations in the plant varied with the crop, was fairly constant for each crop and was unaffected by exchange capacity except in the case of turnips where lower cation sums tended to occur with lower exchange capacities. Increasing Ca-Mg or Ca-K ratios in the soil increased these ratios in the plants where they were smaller than in the soil. The coefficients (*c* values) obtained by dividing these ratios for the soil by the appropriate ratios for the plants yield a measure of the complementary-ion effect which is moderate between Ca and Mg and strong between Ca and K. The order of the *c*Mg and *c*K values was turnips <soybeans <oats. The cation-exchange capacity did not consistently affect the *c*Mg values whereas the *c*K values decreased with decreasing exchange capacity, particularly in turnips. Where $NaNO_3$ was applied and with a constant Ca-Na ratio in the soil, the Ca-Na ratio in the plants tended to increase with increasing K-Na ratio of the soil and with increasing cation-exchange capacity. A direct relationship between the K-Na ratios of the soil and of the plants was shown.

On treatment of the soil with 1 mg. eq. of HCl before planting, release of Ca generally decreased and that of Mg and K increased with increasing Mg and K levels in the soil. Chemical-release studies showed many similarities to uptake of cations by plants. The *f* values, i.e., the Ca-Mg or Ca-K ratios of exchangeable cations in the soil divided by the appropriate ratio in the extract, were compared with *c* values; with decreasing cation-exchange capacity *f*Mg and *f*K decreased.

A scheme is suggested for evaluating the Ca requirements of different plant species.

[12] 631.415.3 : 631.67
CHANDNANI, J. J. **Study of movement of water and salts in soils at the Agricultural Research Station, Sakrand. I.** *Indian J. Agric. Sci.* 17, 1947 (175-179).

Within 5 days of the final irrigation the water had penetrated to 3 and 4 feet when the amounts applied were 4 and 8 acre-inches respectively and beyond 6 feet with an application of 12 acre-inches. The loss of water by evaporation and transpiration in land cropped to cotton was in direct proportion to the amount of water added, and judging from samples of soil collected about 3 months after the last irrigation the soil had less moisture at harvest time than it had before the cotton was sown. There was more loss of water from non-saline than from saline soils and the loss of water varied inversely with the salt concentration, thus making it necessary to irrigate saline soils more frequently than non-saline soils in order to obtain normal crops.

[13] 631.415.36
PAPADAKIS, J. S. Courte note sur l'amélioration des sols salins-alcalins. [**A short note on the improvement of saline-alkaline soils.**] *Bol. Sec. Agric. Pernambuco* 13, 1946 (321-332). Biol. Abs. 22 (1197).

Discussion of types of alkaline soils, their irrigation and the role of organic matter, fertilizing and drainage in their improvement. Alkali-soil conditions in Greece are discussed.

[14] 631.415.36
CHANDNANI, J. J. **Study of movement of water and salts in soils at the Agricultural Research Station, Sakrand. II.** *Indian J. Agric. Sci.* 17, 1947 (181-185).

Surface soils were depleted of soluble salts and made fit for general cultivation by applications of 32 inches of water. NaCl was leached out more quickly than Na_2SO_4. As cropping retards the rise of salts it is recommended that saline soils should be cropped continuously during reclamation. It is advisable during reclamation by irrigation to separate *kalar* lands from non-saline soils by drains or other devices to prevent the lateral movement of salts.

[15] 631.415.7 : 631.416.856 : 631.416.847
WARREN, H. V.; HOWATSON, C. H. **Biogeochemical prospecting for copper and zinc.** *Bull. Geol. Soc. Amer.* 58, 1947 (803-820). For. Abs. 10 (17).

Investigations on the relationships of plants to ore deposits in British Columbia indicated that the Zn and Cu content of some trees and plants may reflect the presence of Zn and Cu concentrations in the underlying soils and rock formations. Cones and needles of *Tsuga mertensiana*, *Pseudotsuga taxifolia*, *Larix occidentalis* and *Pinus contorta* and leaves of *Echinopanax horridus*, *Alnus sinuata* and *Salix* spp. are possible indicators of abnormal amounts of Cu and Zn in their vicinity.

631.416 COMPOSITION OF SOILS

(*See also* Abs. Nos. 15, 116, 227, 263, 283)

[16] 631.416 : 631.58
ROYER, A. E.; BERTRAMSON, B. R.; MULVEY, R. R. **Soil fertility levels as influenced by long-time differential fertilization practices.** *J. Amer. Soc. Agron.* 40, No. 8, 1948 (685-693). [Purdue Univ. Agric. Expt. Sta.]

The total N, available P and exchangeable K resulting from differential fertilizing and differences in manurial and crop-residue management were computed for each treatment in a 30-year experiment under livestock or manure-and-cash-crop, or residue systems of farming. In the livestock system manure and fertilizers were applied at various rates and ratios. In the cash-crop system the crop residues and sufficient fertilizers were returned to the soil to make the returns of plant nutrients comparable to those in the livestock, or manure system. Net removals of N and K_2O for the 30-year period exceeded

1,500 and 350 lb./acre respectively on all plots. The net removals of N and K_2O were greater from the crop-residue plots than from the manure plots. The removal of P was greater from the manure plots. Under the residue system K_2O was the limiting factor in maize and soybean production. The more nearly complete the fertilizer treatment, the greater was the amount of N remaining in the soil. Total N was significantly higher on plots receiving manure, or manure and fertilizer, than on plots receiving residues instead of manure.

[17] 631.416 : 631.81
KONOLD, O.; RIEHM, H. Bodenuntersuchungsergebnisse des Dauerdüngungsversuches von Gerlach auf dem Versuchsgut Mocheln, Schlag XII. **[A soil study relating to Gerlach's long-term fertilizer experiments on plot 12 of the Mocheln experimental farm.]** *Landw. Jahrb.* 93, 1944 (491-508). [G.e.f.i sp.]

In an experiment during 1907-1918, the 5 strips of this plot had respectively received NPK, NP, NK, PK or no fertilizer for 9 of the 12 years. Dry-matter yields and crop removal of P and K had been recorded. Soil (0-20 cm.) and subsoil (30-50 cm.) tests in 1943 after 20 years of uniform cultivation of the whole plot showed clear differences between the strips. P values in the strips ran parallel to manuring and crop abstraction. On this light soil, small amounts of applied P had reached the subsoil together with almost all the applied K which had not been absorbed by plants or leached. The pH values indicate a degree of soil and subsoil acidification by the use of $(NH_4)_2SO_4$, and the humus values show a slight increase, due to increased root growth, in the deeper layer of the strip receiving complete fertilizers.

[18] 631.416.2
BIRCH, H. F. **Soil phosphates—a review of the literature.** *E. Afric. Agric. J.* 14, 1948 (29-33). [Amani]

Recorded observations since 1935 on the form in which soil phosphates occur and the factors that affect their solubility are summarized.

[19] 631.416.2 : 631.414.3
HESTER, J. B. **The fate of phosphate soil supplements.** *Amer. Fert.* 109, No. 3, 1948 (24). [Campbell Soup Co., Riverton, N.J.]

The greater the amount of clay and the larger the amount of Fe and Al in proportion to silicates, the greater is the fixation of P. The greater the amount of organic matter present, the greater is the availability of P. A pH of about 6.5 increases the availability of P. Poor drainage lessens the availability. Ca phosphates are more available than other forms of P.

[20] 631.416.2 : 631.414.3 : 549
MALQUORI, A. **[Clay minerals and phosphorus fixation in the soil.]** *Ricerca Sci.* 18, 1948 (21-32). Bibl. Agric. 12 (41). [I.]

[21] 631.416.323 : 581.192
BEATH, O. A.; EPPSON, H. F. **The form of selenium in some vegetation.** *Wyo. Agric. Expt. Sta. Bull.* 278, 1947, pp.17.

The relationship between type of Se in the soil and in the plant, and the toxic effects to animals of Se-containing vegetation are discussed.

[22] 631.416.323 : 631.471
SEARIGHT, W. V.; MOXON, A. L.; WHITEHEAD, E. I. ET AL. **Detailed mapping of seleniferous vegetation on soils of Pierre origin.** *Proc. S. Dak. Acad. Sci.* 26, 1947 (87-98). B.A.BIII, 1948 (240).

A toxic seleniferous area in S. Dakota was mapped by a combination of methods including the distribution of alkali disease of livestock and of indicator plants, the study of geological strata and the determination of the Se content of vegetation.

[23] 631.416.327
SCHALLER, F. W. **Boron content and requirements of West Virginia soils.** *Soil Sci.* 66, 1948 (335-346). [W. Va. Agric. Expt. Sta.]

The subsurface layer contained less available B than the plough layer. Strongly leached soils of acid grey-shale and sandstone origin were in general lowest in available B and seemed most likely to benefit from B fertilizing. Biologically available B was also determined in these soils but the method was of limited value on West Virginia soils. K alone and KP decreased the B content of lucerne, which was also decreased by added increments of lime, indicating soil fixation of B. B had no significant effect on either the Ca or the K content of the plant tissue.

[24] 631.416.4 : 631.821.1
ROGERS, H. T.; YORK, E. T. **Effects of lime on the release of difficultly soluble soil potassium and on the efficiency of applied fertilizer potassium.** *Ala. Agric. Expt. Sta. Rept. 1945-46*, 1948 (7-8).

The effect of liming depended on the supply of non-exchangeable, but slowly available, K in the soil and the capacity of the soil to absorb bases. Liming a sand of low exchange capacity of 1.1 m.e./100 gm. of soil and a low reserve of soil K (27 lb./acre of exchangeable K_2O) reduced the supply of exchangeable K by 50% 7 weeks after application of fertilizer. The effect of lime on a sandy loam of exchange capacity 1.9 m.e. and 77 lb./acre exchangeable K_2O was the reverse; exchangeable K was approximately doubled by liming where no K was added and was increased to a lesser degree when fertilized.

[25] 631.416.7 : 631.472
DAS, S. **The effect of manuring and cropping on the vertical distribution of carbonates in Pusa calcareous soils.** *Indian J. Agric. Sci.* 17, 1947 (14-24). [Imp. Agric. Res. Inst., New Delhi]

Three-inch soil borings up to a depth of 5 feet were taken of 9 permanent manurial plots and an adjacent fallow plot. 2 zones of maximum $CaCO_3$ concentration with 1 of minimum concentration lying between them, were found in all except the fallow plot. Above these zones were 2 more zones of low and medium carbonate concentrations. In the fallow plot a gradual increase in carbonate concentration occurred from the surface downward. The total $CaCO_3$ content of these soils remained almost constant to a depth of 5 feet, below which there was no appreciable leaching of $CaCO_3$ but a distribution from layer to layer within this depth according to the effect of different fertilizer salts on the solubility of $CaCO_3$.

[26] 631.416.856 : 631.461
CIFERRI, R.; SCARAMUZZI, G. Metabolismo della popolazione microrganica del suolo e solubilizzazione dell' ossido cuproso nel terreno. [**Metabolic activity of the soil's microbial population and solution of cuprous oxide in the soil.**] *Atti Ist. Bot. Univ. Lab. Crittog. Pavia, Ser.* 5, Vol. 3, 1947 (233-237). [I.e.]

From seven approximately neutral soils mixed with Cu_2O, distilled water to which toluene had been added extracted 1-8 p.p.m. of Cu after shaking; incubation for 24 hours did not appreciably increase the Cu solubility. Incubation of similar soil suspensions in presence of 1% of glucose increased the amount of soluble Cu, especially when toluene was absent, and 1% of gelatine or peptone, or mixtures of them, or 0.5% of asparagine increased the solubility markedly: up to 200 or 300 p.p.m. in presence of toluene and about twice as much in its absence. About 1200 p.p.m. of Cu were dissolved under such conditions by 0.5% citric or isomalic acid whether toluene was present or not. It is suggested that the ability of glucose in un-toluened soil to dissolve Cu from Cu_2O is due to the metabolic products of soil micro-organisms, e.g., organic acids, and that gelatine acts through its hydrolytic products.

Three colorimetric methods for determining Cu in solution were used for the ranges 0.1-2, 2-20, and 100-500 γ Cu per ml. The technique of the most sensitive methods (Quartaroli and Delavigne's) is given in full. It depends on the ability of ionic Cu to catalyse oxidation of ferrous ammonium sulphate to a ferric salt in HNO_3 buffered with sodium acetate.—R.N.

[27] 631.416.871.1 : 631.436
HURWITZ, C. **Effect of temperature of incubation of amended soil on exchangeable manganese.** *Soil Sci.* 66, 1948 (267-272). [Mass. Agric. Expt. Sta.]

As there was no increase in exchangeable Mn unless organic matter was added to the soil it was concluded that the effect of temperature on the exchangeable Mn was a result of the effect on the decomposition of the plant residues. The decrease in exchangeable Mn, which commenced after the third day, was probably caused by the Mn-oxidizing bacteria. Since the increase in exchangeable Mn as a function of increasing incubation temperature becomes logarithmic above 30°C., the use of heat for complete or partial sterilization of soil should be investigated. It is conceivable that toxic concentrations of Mn might result from the practice of steam sterilization of seedbeds and greenhouse soils; if the Mn-oxidizing bacteria were destroyed by heat,

the decrease of the toxic concentrations of Mn by oxidation to the insoluble higher oxides would be prevented or markedly slowed down.

[28] 631.416.876

TINELL, R. Sur la présence du chrome dans les sols de France. **[On the presence of chromium in French soils.]** *C.R.* 227, 1948 (608-610). [F.]

The analysis of about fifty samples from different parts of France showed that all soils contained small amounts of chromium. The largest amount was found in clay soils, the smallest in a humiferous alluvial soil.

[29] 631.416.877 : 619

ROBINSON, W. O.; EDGINGTON, G. **Toxic aspect of molybdenum in vegetation.** *Soil Sci.* 66, 1948 (197-198).

The molybdenum-oxide content (as MoO_3) of a number of vegetation samples is shown in a table. All the samples from a high-Se area in South America are also very high in Mo and peas and grains from this area are highly toxic to cattle and humans. This toxicity has been ascribed to Se but it has now been questioned as to what part Mo plays in the observed toxicity of grains from this area. Borderline cases of Mo toxicity are believed to occur at much lower limits than the 20 p.p.m. limit suggested for teart pastures in England.

631.417 ORGANIC MATTER

(*See also* Abs. No. 61)

[30] 631.417.4 : 631.58

DODGE, D. A.; JONES, H. E. **The effect of long-time fertility treatments on the nitrogen and carbon content of a prairie soil.** *J. Amer. Soc. Agron.* 40, No. 9, 1948 (778-785).

N and C studies since 1911 of the 0-7-inch layer of a silty clay loam show: (1) a continual loss of C and N regardless of cropping system or fertilizer treatment. Plots with the highest N contents suffered the greatest N losses. N loss was similar in the 3-year rotation maize, cowpeas, wheat and in the 16-year rotation comprising 4 years of lucerne + 4 cycles of maize, maize, wheat. The N level with these rotations was higher than that with continuous wheat, under which the N content has almost reached an equilibrium, (2) C loss was greatest on the 3-year-rotation and continuous-wheat plots. Dry-matter yields were highest for the rotation containing lucerne and for complete fertilizing, but these had relatively little influence on the C and N levels. The C/N ratio has widened during the 16-year rotation, and remained essentially the same for the 3-year rotation and continuous wheat. While the cropping and fertilizing practices have only slightly influenced the N and C trends, it appears that they may have some influence on the speed with which an equilibrium is reached and on the ultimate level.

631.42 TECHNIQUE AND ANALYSIS

(*See also* Abs. Nos. 26, 191, 211, 276)

[31] 631.421

MA, R. H.; HARRINGTON, J. B. **The standard errors of different designs of field experiments at the University of Saskatchewan.** *Sci. Agric.* 28, 1948 (461-474). [Univ. Saskatchewan, Saskatoon]

The average value of the standard error for randomized blocks, semi-latin squares and lattice designs, their relative efficiency for field testing and the probable number of replicates required in the planning of future experiments are discussed.

[32] 631.423 : 544.6

MITCHELL, R. L. **The spectrographic analysis of soils, plants and related materials.** *Comm. Bur. Soil Sci. Tech. Comm.* 44, 1948, pp. 183. [Macaulay Inst. Aberdeen]

[33] 631.423.3 : 631.411.2

MCGEORGE, W. J. **Soil analysis—Western soils.** *Better Crops* 32, No. 7, 1948 (9-14, 46-47). [Agric. Chem. Expt. Sta., Tucson, Ariz.]

The soil tests discussed are those used by the Arizona Experimental Station to determine the availability of P, N, K and salinity in alkaline-calcareous soils. Nitrate, P and K are determined in the carbonic-acid extract. Electrical conductivity methods are usually employed to determine salinity. The soluble salt is determined in a 1 : 5

water extract of a soil and this is converted to p.p.m. of soil or pounds per acre foot of soil. For field tests a supply of carbonic acid can be carried in a "sparklet" syphon.

[34] 631.423.3 : 631.416.2
BURRIEL, F.; HERNANDO, V. **[Phosphorus in soils. II. The interference of iron and other elements in the colorimetric determination of phosphorus.]** *An. Soc. Esp. Fis. Quím.* 44, Ser. B, 1948 (329-344). C.A. 42 (7473). [Sp.]

An equivalent quantity of Na_2SO_3 is preferable to $NaHSO_3$ to avoid Fe interference in the colorimetric determination of P. As does not interfere when in the form of arsenite, nor as arsenate in quantities up to 16 mg. of As. No interference occurs when less than 3% of H_2O_2 is used to destroy organic matter. TiO_2 in quantities greater than 1.5 mg. causes turbidity and interferes with colour. SiO_2 can be present up to 3.5 mg. without interference. If more is present it should be eliminated by boiling for 15-20 min. with 60% $HClO_4$ or evaporating with fuming H_2SO_4. F is eliminated by the same treatment. Tartaric and citric acids do not interfere if present in amounts not exceeding 20 mg. and 10 mg. respectively.

[35] 631.423.3 : 631.416.7
KEHRING, A. G. **Determination of calcium in soils.** *An. Assoc. Quím. Brasil* 6, 1947 (219-233). C.A. 42 (7472). [Inst. Quím. Agric., Rio de Janeiro]

Owing to the high Fe and Al contents of Brazilian soils, together with the presence of Ti and Mn, Ca is determined by a method involving refluxing the HCl extract with 0.1 n. $CaCl_2$, followed by boiling with saturated KCl. After completing precipitation by the addition of NH_3, the precipitate is redissolved with hot 10% oxalic acid. Boiling ammonium oxalate is added and the reaction adjusted to pH 4. The mixture is kept hot for 1 hour, left to stand overnight and filtered. The precipitate is treated with 5% H_2SO_4 and titrated at 80°C. with 0.1 n. $KMnO_4$. The CaO content of the Brazilian samples ranges from 7 to 287 mg. per 100 g. of soil.

[36] 631.423.3 : 631.416.846
MIKKELSEN, D. S.; TOTH, S. J.; PRINCE, A. L. **Determination of magnesium by thiazol yellow method.** *Soil Sci.* 66, 1948 (385-392). [N.J. Agric. Expt. Sta.]

With this method, which is claimed to give accurate results, the interfering ions (Ca, Al, Fe and Mn) are removed as insoluble tungstates and the Mg is directly determined spectro-photometrically in the supernatent liquor after centrifuging, in a single operation. The most favourable reaction range for the precipitation is pH 5-6.5.

[37] 631.423.4
CAROLAN, R. **Modification of Graham's method for determining soil organic matter by colorimetric analysis.** *Soil Sci.* 66, 1948 (241-247).

In Graham's method (see *Soils and Fertilizers* 11 (165)) the oxidized diluted mixture is allowed to stand 4-5 hours to remove turbidity, whereas if this mixture, on cooling to room temperature, is filtered through Whatman No. 1 or similar paper, rejecting the first 20 ml., a batch of 10 soils can be tested in about an hour. There is no interference from coloured matter in incompletely oxidized soil. In laboratories with no facilities for organic combustions, calibration graphs may be prepared by stoichemical calculation.

[38] 631.423.4 : 547.21
CRAWFORD, F. W. **Determination of the hydrocarbons in soil gases.** *U.S.Pat.* 2,427,261. B.A.BIII, 1948 (273). [Phillips Petrol. Co.]

An all-glass apparatus using Hg cut-off valves for controls is described, including an adjustable leak valve for regulating gas flow through the apparatus and a novel combustion unit. The gas to be analysed is mixed with air and passed through the partly evacuated gas train; the hydrocarbons present or their combustion products are caught in cold traps or on solid absorbents where they can be determined quantitatively by manometric measurements. CO_2 and H_2O are removed by KOH and P_2O_5. Hydrocarbons heavier than CH_4 are trapped in a condenser, immersed in liquid M; the CH_4 is burned to CO_2. C_2H_6 is distilled from the heavier hydrocarbons by immersing the condenser in liquid O_2 and pumping off the C_2H_6. Complete diagrams of the apparatus and a detailed analytical procedure are given.

[39] 631.425.22
BAVEL, H. M. VAN. Nieuwere Amerikaanse methoden ter bepaling van de bodemvochtigheid in het veld. **[Recent American**

methods for the estimation of soil moisture in the field.] *Landbouwk. Tijdschr.* 60, 1948 (120-124). [Du.e.]

Methods reviewed and discussed comprise tensiometric, gravimetric, thermo-electric, resistance-block and capacity.

[40] 631.425.22
BOUYOUCOS, G. J.; MICK, A. H. **A comparison of electric resistance units for making a continuous measurement of soil moisture under field conditions.** *Pl. Physiol.* 23, 1948 (532-543). [Dept. Soil Sci., Mich. St. Coll., East Lansing]

For most practical purposes it is not necessary to calibrate plaster-of-Paris absorption blocks. Resistance readings may be directly interpreted in terms of available soil water; in all soils the percentage of available water is approximately the same for any given resistance value. Several types of adsorption units are described and compared by means of laboratory calibration curves. Some of these units offer great promise of measuring soil moisture from saturation to dryness. The advantages are that the soil need not be disturbed after the initial installation, readings may be made by unskilled labour, single readings require not more than a minute, the units can be completely buried and thus do not interfere with surface tillage or plant growth, and they are not costly.

[41] 631.425.22
NATIONAL ROAD BOARD, SOUTH AFRICA. **Methods of moisture determination of soils with emphasis on rapid methods for use in the field.** *Road Abs.* 15, 1948 (71). B.A.C. 1948 (213).

The following methods are discussed: (a) acetylene gas pressure, (b) electrical resistance, (c) hot air from below and from above.

[42] 631.425.23.005
GRIGNET, P. **Apparatus for determining the laws and coefficients of permeability of non-cohesive soils.** *Trav. Cent. Étud. Eaux* 2, 1943 (87-100). B.A.BIII, 1948 (309).

[43] 631.427.3
HALAIS, P. Microdosages rapides de N, P et K par colorimétrie photo-électrique utilisés à Maurice pour le diagnostic foliaire de la canne à sucre. **[Rapid determination of N, P and K by photo-electric colorimetry used in Mauritius for foliar diagnosis of sugar-cane.]** *Rev. Agric. Maurice* 27, 1948 (100-112). [F.]

[44] 631.427.3 : 631.547.2
MARQUARDT, A. Das Ertragsgestz und das Gesetz des Minimums. **[The yield law and the law of the minimum.]** *Landw. Jahrb.* 93, 1944 (429-458). [G.e.f.i.sp.]

The two laws are dependent and supplementary and neither can be scientifically explained without the other. Krzymowki's "maximum net yield" is shown to be meaningless, and Aeroboe's limit of rentability is again confirmed. All the experimental results studied by the author lead, however, to the novel conception that this limit of rentability can hardly be reached even under the most favourable experimental conditions and is never approached in farming practice: on the yield curve it lies outside the point marking the end of the disturbance-free section, and the 2 points provide a scientific expression of the production reserves.

631.43 SOIL PHYSICS

[45] 631.43 : 631.547.2
BRAVER, H. E. **Response of certain legumes to variations in soil and microclimate on eroded areas in southeastern Iowa.** *Ecol. Monogr.* 17, 1947 (471-500). Biol. Abs. 22 (1531). [Ala. Polytech. Inst., Auburn]

Differences in establishment and growth of 25 leguminous species were related to variation in chemical and physical soil properties and in microclimate on 1 lowland and 2 upland sites within an eroded area of less than $\frac{3}{8}$ mile radius. At the 6-18 inch depth, only exchangeable Ca showed a positive significant correlation with plant response; at the 0-6-inch depth, total exchangeable bases, percentage N and C and exchangeable Ca were highly correlated. Plant establishment and growth were not significantly correlated with either pH or percentage base saturation. Limited measurements of soil physical factors indicated better plant establishment and growth with increase in available soil moisture and improved structure. Soil-temperature differences between sites were distinct. Micro-

climatic study of the 2 slopes, which faced southeast, showed that the slope having slightly more southerly exposure had greater evaporation, lower relative humidity and higher maximum air and soil temperatures. The average plant response was poorer on the drier site than on the site whose microclimate and soil physical properties were more favourable, but whose soil chemical properties were less favourable.

[46] 631.432.2 : 551.557
KIRKALDY, J. F. **Soil and weather.** *Weather* 3, 1948 (225-231).

Drainage water, available and unavailable water, total evaporation from soil surfaces, percolation and runoff are discussed. Soil maps, made during the war, are described that contained a legend stating how the different types were expected to behave under different weather conditions. So far the influence of weather on soil has been considered only as a wartime problem and a plea is made for accurate long-term forecasting of rainfall amounts and the proportion of that rainfall that would be disposed of by percolation, total evaporation or runoff.

[47] 631.432.2 : 581.032.3
HENRICI, M. **Effect of excessive water loss and wilting on the life of plants, with special reference to Karoo plants and lucerne.** *S. Afric. Dept. Agric. Bull.* 256, 1946, pp. 22. [Veld Reserve, Fauresmith]

Except during rainy periods, most veld plants in the semi-arid parts of South Africa are perpetually in a state of incipient drying or of water deficiency, although the plants do not show signs of wilting. In lucerne crops, incipient drying with subsequent recovery occurs every warm day unless the crops are irrigated throughout. If this process continues in a soil with insufficient moisture, death will ultimately occur.

[48] 2053 631.432.2 : 631.436
ROSEAU, H. Sur la circulation de l'eau dans le sol. **[The circulation of water in the soil.]** *C.R. Conf. Pédol. Méditerr. 1947*, 1948 (389-404). [F.]

Measurements of drainage from lysimeters in Algeria showed that drainage sometimes increased, when there was no precipitation with an increase in air temperature. The explanation given is that when the surface of the soil is heated the water in the soil is vaporized and distils downwards to cooler layers beneath. In a cultivated soil there is also considerable loss of water by evaporation, but in an uncultivated soil the main movement of water in the hot, dry period is downwards. It is suggested that the reason for the beneficial effects of early spring hoeing and scarifying is not the destruction of capillary canals and therefore the reduction of surface evaporation, but the protection of the underlying soil, by a layer of loose earth, from temperature variations and a consequent reduction in loss of water by distillation and downward movement.

[49] 631.432.2 : 631.445.5
GRILLOT, G.; BRYSSINE, G. Contribution à l'étude de l'humidité des sols du Maroc. **[Contribution to the study of the humidity of the soils of Morocco.]** *C.R. Conf. Pédol. Méditerr. 1947*, 1948 (420-433). [F.] [Rabat]

Measurements were made of soil moisture during a two-year rotation of wheat—cultivated fallow with and without the ploughing-in of a green manure after the wheat. The soils observed were a heavy black *tirs*, a red calcareous clayey *hamri*, and a greyish-pink structureless sandy *r'mel*. The region was one of winter rainfall. In all cases observed, regardless of soil type or cropping treatment the water content of the soil during winter was equal to or greater than the water-holding capacity. It fell before the end of the rains in the *tirs* and *hamri* soils, but remained at a maximum in the *r'mel* soil right until the end of the rains. Growth of wheat dried out the soils thoroughly, but the humidity remained fairly high under bare fallow, whether or not a green manure had been ploughed in in the winter. If the green manure had been ploughed in in the spring, however, it would have exerted a harmful effect by expenditure of water that would otherwise have been stored in the soil during the fallow. The compact and heavy *tirs* soil lost more water during the summer than the porous, structured *hamri* soil.

[50] 631.432.2 : 631.547.2
WADLEIGH, C. H.; GAUCH, H. G. **Rate of leaf elongation as affected by the intensity of the total soil moisture stress.** *Pl. Physiol.* 23, 1948 (485-495). [U.S. Reg. Salinity and Rubidoux Labs., Riverside, Calif.]

Recent studies have shown that an interrelationship exists between soil salinity and the soil-moisture content in their effect on plant growth. Leaf elongation virtually ceased at the higher intensities of induced soil-moisture stress and was resumed on alleviation of the stress by irrigation.

[51] 631.432.2 : 636.084.22
CHAPMAN, E. **An analysis of the data obtained from the run-off plots at Halefka and Sykhari 1939-1944.** *Cyprus For. Dept. Tech. Pamph.* 9, 1948, pp. 7. For. Abs. 10 (18).

By comparing fenced and unfenced plots it was shown that, by protection against grazing, the quantity and quality of vegetation is improved, xerophytic species tending to disappear and mesophytic species to come in.

[52] 631.432.3
BENDIXEN, T. W.; HERSHBERGER, M. F.; SLATER, C. S. **A basis for classifying soil permeabilities.** *J. Agric. Res.* 77, 1948 (157-167). [S.C.S., U.S.D.A.]

A combination of measurements of amount of pore space drained in 1 hour under 60 cm. of water tension and of percolation rates was used as a basis for developing definitions of classes of soil permeability. Data on a group of Coastal Plains soils show the general relationship between the amount of pore space drained and percolation rates. Data on these soils show that this general relationship is reasonably constant for soils of widely different textural composition. Data on a group of Ohio soils show how this relationship may change for soils of widely different structural characteristics with different pore-size distributions. Definitions are given of 7 proposed permeability classes showing permeability rates of from <0.05 to >10 inches per hour. These were first defined in terms of the amount of pore space drained and from the general pore space—percolation relationship the comparable permeability rates were obtained. This procedure was used because pore-space measurements appeared to be a more reliable measure of permeability.

[53] 631.434
HÉNIN, S. Essai d'une théorie de la stabilité de la structure des sols. [**Testing a theory of the structural stability of soils.**] *Plant and Soil* 1, 1948 (167-178). [F.] [Lab. Sols, Versailles]

In the theoretical treatment presented, a soil sample prepared in the same manner as for mechanical analysis was considered. If C = cohesion, S = stability, r = diameter of the largest soil capillaries, T_1 = surface tension of the soil, T_2 = the surface tension of water, T_{12} = the soil-water interfacial tension and A = the soil-water affinity, according to the author's hypothesis $S = [rC - 2(T-T_{12})]/r$. If $T_{12} = T_1 + T_2 - A_1$ then $S = [rC + 2T_2 - 2A]/r$ and the condition under which disintegration occurs may be written $rC + 2T_2 < 2A$.

The conditions of stability, disintegration and colloidal dispersion of a soil for the various relationships of rC, $2T_2$ and $2A$ are tabulated. The hypothesis was confirmed by consideration of the effects of cohesion and of wetting under various pressures. The latter effect was determined in the presence of air and of liquids such as CCl_4 and CS_2. The increase in stability as a result of wetting the CCl_4-treated soil by capillary action also confirmed the hypothesis and, with the other experiments, supported Schloesing's theory. However, the two hypotheses proposed are still insufficient as was shown by consideration of the effects of lime and organic matter on stability. It is concluded that it is necessary to use a series of methods to determine structural stability and although the utilization of such methods has yet to be realized it is possible to give useful practical advice by using those indicated in the paper.

[54] 631.434 : 547.454 : 547.96
GEOGHEGAN, M. J.; BRIAN, R. C. **Aggregate formation in soil. 2. Influence of various carbohydrates and proteins on aggregation of soil particles.** *Biochem. J.* 43, 1948 (14). [I.C.I., Jealott's Hill Res. Sta.]

The aggregating effects of *Penicillium luteum* polysaccharide, a Na salt of carboxymethyl cellulose, an ether of cellulose, quince gum, pectin, inulin, egg albumin, trypsin, pepsin and pancreatin, were investigated [see Biochem. J. 43 (5-13)]. Results indicated that fungal polysaccharides and some proteins are capable of aggregating soil particles. Pectin, in spite of its high specific viscosity, failed to aggregate soil.

[55] 631.434 : 547.458
GEOGHEGAN, M. J.; BRIAN, R. C. **Aggregate formation in soil. 1. Influence of some**

bacterial polysaccharides on the binding of soil particles. *Biochem. J.* 43, 1948 (5-13). [I.C.I., Jealott's Hill Res. Sta.]

Levans were isolated from cultures of *Bacillus subtilis* on mineral-salt media to which various amounts of sucrose were added. *Leuconostoc dextranicum* and *L. mesenteroides* were used for the preparation of dextrans. Soil of poor structure was treated so that different samples contained 0.05—0.75% polysaccharide. Up to 0.25%, the aggregating effect, which was determined by wet sieving, was linearly related to the amount of levan or dextran added. All the polysaccharides had a marked ameliorative effect on the physical condition of the soil, the aggregating effect of the levan decreasing with increase in sucrose content of the medium and varying with different lots of culture solution. The aggregating effect of 0.75% levan was not increased by raising the amount to 2 and 5%. The intrinsic viscosities, and hence the molecular weights, and aggregating effect of the levans decreased with increasing sucrose content of the medium. Treatment of the levans with hot dilute NaOH gave a degraded product with a reduced N content and a very low aggregating effect. The re-formation of water-stable aggregates in levan-containing soils by drying to the sticky point, after breaking down the original aggregates by shaking in water for an hour, suggests that a certain amount of levan is fixed on the soil particles. This levan is slowly decomposed by soil micro-organisms.

[56] 631.434 : 631.582
FENG, C. L. **Effect of crop rotation on soil aggregation and related characteristics in a Belinda silt loam soil.** *Iowa St. Coll. J. Sci.* 22, 1947 (24-26).

The effects of 8 different rotations with maize, oats, sweet clover, soybeans and meadow on total soil aggregates, size distribution, aggregate stability and permeability were studied, especially as they were affected by seasonal variation.

631.44 SOIL TYPES

(*See also* Abs. Nos. 25, 63, 301, 331)

[57] 631.44 : 631.435.4
REINHOLD, T. **Proposed classification of clay soils.** *Verre Silicates Indust.* 13, 1948 (46). B.A.BIII, 1948 (309).

The proposed system includes geological age, association of clay minerals, granulometric composition and content of free $CaCO_3$ and Al_2O_3.

[58] 631.44 : 631.435.5
NIKIFOROFF, C. C. **Stony soils and their classification.** *Soil Sci.* 66, 1948 (347-363). [U.S.D.A.]

It is suggested that the term "stony" should be applied to all soils that contain a certain quantity of stones of any kind, size or shape, rather than only to soils having stones of some particular kind or size. The concept of soil texture, or mechanical composition of the soil, should be broadened to cover the coarse or stony fractions, and classes such as stony loam, gravelly loam and gritty loam should be used. Discrimination should be made between stony land and stony soil. A table shows a tentative systematic grouping of stony soils, on the basis of their stoniness, into gritty; gravelly; cobbly; rubbly; soils with heterogeneous stony fraction; fine and coarse-skeletal; rock-soled soil, developed from a thin regolith underlain by a solid, hard bedrock at about 1-10 feet depth; embryonic soil, which differs from a rock-soled soil in the absence of an abrupt boundary between the regolith and the underlying hard rock. Most embryonic soils are gritty and many of them skeletal, the content of coarse skeleton increasing with depth; cryptogenic soils which include perennially infantile soils, soils on fresh regoliths and old soils lacking sufficient horizon differentiation.

The principles of classification, the determination of the taxonomic ceiling of stoniness and nomenclature are discussed.

[59] 631.445.6
CHOUBERT, G. Sur la nature des limons rouges superficiels du Maroc. [**The nature of superficial red loams in Morocco.**] *C.R.* 227, 1948 (639-641). [F.]

In Morocco and probably throughout the Mediterranean there are several formations of red soils of different ages. The influence of parent rock and climate on the formation of these soils is discussed. They are (1) red or pink loams of the great plains that are older than the Tyrrhenian calcareous crusts, (2) greyish pink Temara formations of the

coast, contemporaneous with the calcareous crusts, (3) superficial red loams (hamri) which are of later formation than the crusts; their colour varies with the climate and is red on the coast and in the calcareous mountains, brownish in the interior, clear pink in the Sous and the Da and whitish in the south-east. Red soils do not occur in non-calcareous areas and even in the calcareous mountains black soils are as frequent as red soils.

[60] 631.445.7

ERHART, H. Les caractéristiques des sols tropicaux et leur vocation pour la culture des plantes oléagineuses. [**The characteristics of tropical soils and their suitability for the cultivation of oil plants.**] *Oléagineux* 2, 1947 (293-303). [F.]

The general problems of the origin of soils in relation to phyto-geography are discussed. Soils described include the clay laterites of the forests and tropical grasslands of Madagascar, carapace and ancient alluvial laterites of Madagascar and the middle Niger, and podzols and *orstein* soils of the deciduous forests of French North Africa, Madagascar and the areas on the southern border of the Sahara.

[61] 631.445.7 : 631.417

MAREL, H. W. VAN DER. De betekenis van de humus voor de water- en stikstof-huishouding in de tropen. [**The significance of humus in the water and nitrogen economies in the tropics.**] *Landbouwk. Tijdschr.* 60, 1948 (115-120). [Du.]

In tropical climates the rapid decomposition of humus results in low N and moisture contents of the soils. In many soils, e.g., the coarse andesitic ash soils of Kloet and Merapi, the liparitic Toba-tuff soils on the east coast of Sumatra and the andesitic coastal clays of Java, the humus content is 1% or less and the moisture capacities are 28-33%, 40-60% and 60-70% respectively. Owing to the clayey nature of the low-lying alluvial soils on the west coast of Atjeh, humus decomposition takes place more slowly; the moisture capacity is 30%. N contents vary from 0.06% to 0.12% in the Toba-tuff soils and from 0.02% to 0.05% in the coastal andesitic clays of Java, that show a marked response to N manuring. When planting an exhausting crop such as sugar cane which removes 125 kg./ha. of N per harvest, 800 kg./ha. of $(NH_4)_2SO_4$ must be added to obtain optimum yields. The peat soils are usually fertile but loose, and offer little mechanical support for plants.

Humus and moisture contents may be raised by the addition of organic matter in the form of clippings or residues. Mixing a sandy liparitic soil with 5% of sisal waste, shredded grass or oil-palm residues raised the water-absorbing capacity from 39 to 48-50% and the water-retaining capacity from 2 to 10-11%. Ploughing-in legumes, which produce 20-50 tons of dry organic matter per ha. per year, also raises the humus content especially of the finer, more poorly drained soils, and favourably affects the water economy. Intercropping with legumes in plantations of sisal, young oil palms and young rubber raises the soil-N content by 0.02%, corresponding to 600 kg./ha. after a year, but the activity of the nodule bacteria in older plantations of oil palms and rubber practically ceases. The crop plant may also suffer as a result of root competition.

Other methods of conserving humus and moisture include the planting of deep-rooting shade plants which bring moisture to the surface and lessen evaporation. Terracing prevents the removal by run-off of the humus-bearing top soil.

[62] 631.445.7 : 631.44

DEMOLON, A.; AUBERT, G.; HÉNIN, S. Tendances actuelles de la pédologie dans les régions tropicales et subtropicales. [**Current trends of pedology in tropical and sub-tropical regions.**] *C.R.* 227, 1948 (5-8). [F.]

At the C.A.B. conference on tropical soils held at Rothamsted in June 1948, two tendencies regarding soil classification were apparent, one towards a genetic and the other towards a morphological classification. To establish a genetic classification based primarily on the effect of climate on parent rock is difficult owing to the complications introduced by other soil-forming factors. In the tropics much use is being made of the concept of the catena, introducing the factor of topography into soil classification. One of the main advantages of the morphological system is that it enables a general reconnaissance soil map to be made immedi-

ately which, however, often has only a subjective value. When the soil properties distinguished have a utilitarian value the classification tends to become ecological rather than pedological. At present the two systems exist side by side, and a universal classification has not been attained.

The use of fertilizers should be made possible in native agriculture, but, to accomplish this, great social and economic changes must be made. Application of fertilizers would bring tropical soils more into line with European soils, increase agricultural production and result in general economic improvement.

631.452/3 FERTILITY. TOXICITY

(*See also* Abs. No. 243)

[63] 631.452 : 631.81

EDELMAN, C. H.; BEUKERING, J. A. Over arme gronden in West-Europa en in de Tropen. **[On deficient soils in Western Europe and in the tropics.]** *Landbouwk. Tijdschr.* 60, 1948 (76-83). [Du.] [Inst. Reg. Bodemk. Landbouwhoogesch.]

Under Dutch conditions the distinction between rich and deficient soils is felt to be obsolete, as soils which are deficient in nutrients can be made productive by the application of fertilizers although the cost may be high. Examples of such soils are the sandy soils of the bulb-growing areas and the peat soils; although deficient in nutrients these have suitable physical properties. The difference between good and poor soils lies in their physical properties, productive capacity being determined by water and air content.

The same principle holds for the tropics but to a different degree. Rich soils such as young volcanic soils that are capable of producing high yields occur, but the most widespread group, the lateritic soils, are old and deficient in nutrients. Fertilizing is impossible under many present economic systems and the regenerative processes during resting periods are primarily connected with the N accumulated in the organic remains of the vegetation. About 20 kg. of "cyclic salt" per ha. per year is contributed by rainwater. This is of no practical value on manured or fertile cultivated soils, but in forests it accumulates and amounts to a considerable quantity after a period of years. Plant nutrients are also distributed by animals. Irrigation raises soil fertility by providing water, dissolved nutrients and silt, and where it is impossible to apply fertilizers there is a tendency to supply the land with as much water as possible. This, however, leads to deterioration of physical properties.

[64] 631.453 : 546.16

LEONE, I. A.; BRENNAN, E. G.; DAINES, R. H. ET AL. **Some effects of fluorine on peach, tomato and buckwheat when absorbed through the roots.** *Soil Sci.* 66, 1948 (259-266). [N.J. Agric. Expt. Sta.]

Seedlings of (1) peach, (2) buckwheat and (3) tomato in pots received complete nutrients together with NaF at rates providing 0-400 p.p.m. of F. Preliminary results show that F accumulation in the plants increased with the F concentration in the medium, and the F concentration in the leaves greatly exceeded that in the stems. 200 p.p.m. was fatal to all 3 types within 3-5 days, general wilting being followed by leaf scorching progressing from petioles and veins, the original brown colour bleaching to buff with time. 100 p.p.m. severely injured (1) and (2) in 3 days and (3) in 18 days. 10-50 p.p.m. moderately injured (1) and (2) in 13 days while with (3) symptoms appeared in 48 days. With 10 p.p.m. only the leaves of (1) showed injury. Scorching due to medium applications to actively growing plants spread from the tips of the younger leaves along the leaf margin and finally toward the midrib, but leaf injury to peaches approaching the dormant stage appeared as marginal scorching of the youngest fully expanded leaves.

631.459 SOIL EROSION

(*See also* Abs. Nos. 300, 305, 353, 357)

[65] 631.459 : 551.55 : 581.5

BEADLE, N. C. W. **Studies in wind erosion. Part III. Natural regeneration on scalded surfaces.** *J. Soil Conserv. Serv. N.S.W.* 4, 1948 (123-134).

The course of natural regeneration under unstocked conditions is outlined for three scald types—soft scalds, compacted clays and cemented sands. Regeneration is most rapid on the first and slowest on the second

type. Successional stages are similar on all types. An important perennial colonizer is the diamond saltbush, *Atriplex semibaccatum*, which promises to be of considerable value in erosion-control projects.

[66] 631.459 : 551.55 : 631.61
BEADLE, N. C. W. **Studies in wind erosion. Part IV. Reclamation of scalds: general considerations.** *J. Soil Conserv. Serv. N.S.W.* 4, 1948 (160-177).

Of the several factors retarding regeneration on scalded surfaces only two, the concentration of seed and the rate of infiltration of water, can be controlled. The rate of infiltration can be increased by accumulating wind-blown sand on the surface without disturbing the scald or by loosening the surface with agricultural instruments. Ploughing, although it should be the first treatment, cannot by itself be effective as a permanent erosion-control measure, as it is inevitably followed by compaction of the soil and the redevelopment of the scalded condition; perennials must be established immediately in large numbers in the ploughed soil before recompaction is complete. The establishment of suitable perennials is, however, a difficult problem and calls for further detailed investigations.

[67] 631.459 : 551.577
CHAPMAN, G. **Size of raindrops and their striking force at the soil surface in a red pine plantation.** *Trans. Amer. Geophys. Un.* 29, 1948 (664-670). [Yale Univ.]

Measurements were made of raindrop size beneath a red-pine canopy and in an adjacent open field during several storms in 1946 and 1947. At rates of precipitation of less than 2 inches/hour the kinetic energy of rainfall beneath the red-pine canopy exceeded that of rainfall in the open.

[68] 631.459 : 631.61
CONNOLLY, E. G. **A review of a few selected soil conservation research studies in the U.S.A. Part I.** *J. Soil Conserv. Serv. N.S.W.* 4, 1948 (171-177).

A review of some American investigations dealing with the effects on soil conservation of vegetation, cultivation and infiltration and of the length and gradient of slopes.

[69] 631.459 : 631.61 : 634.9
SMITH, C. M. **Functions of the forester in soil conservation.** *N.Z. J. For.* 5, 1947 (278-284). For. Abs. 10 (18).

[70] 631.459 : 634.953.6
TRENK, F. B. **Influence of planted tree belt in Plainfield sand on erosion control and moisture conservation.** *Iowa St. Coll. J. Sci.* 22, 1948 (449-461).

Coniferous trees averaged 17 feet in height at 10 years of age and were then effective in trapping snow on the adjacent field to the leeward side and in protecting soil and crops against west-wind injury. Cultivation for the first 5 years stimulated tree-height growth. Application of N benefited deciduous trees, but did not increase the growth rate of conifers. Application of K alone, and K + P gave only slightly more favourable growth rates than no treatment. Legume and grass hays continued to thrive under a continuous blanket of snow deposited on the leeward side of the shelterbelt.

631.46 SOIL MICROBIOLOGY

(*See also* Abs. Nos. 26, 55, 281)

[71] 631.461
CONN, H. J. **The most abundant groups of bacteria in soil.** *Bact. Rev.* 12, 1948 (257-273). [N.Y. St. Agric. Expt. Sta. Geneva]

The subject is reviewed under the headings: the significance of soil flora studies; methods of classification; the zymogenous flora which are divided into those requiring special media and those growing on ordinary media; the indigenous flora; methods of identification. 52 refs.

[72] 631.461 : 576.809.7
SCHATZ, A.; HAZEN, E. L. **The distribution of soil micro-organisms antagonistic to fungi pathogenic to man.** *Mycologia* 40, 1948 (461-477). [N.Y. St. Dept. Health, Albany]

Distribution of soil micro-organisms antagonistic to certain pathogenic fungi was studied with a deciduous-forest soil, a field soil and a leaf compost, the pH values of which were approximately 5.3, 8.4 and 6.1 respectively. The soil micro-organisms were

isolated at random and by selective plating techniques. 124 of the 243 actinomycetes tested by the agar-streak method were active against one or more of the four test organisms. The forest soil contained a somewhat higher percentage of antagonistic actinomycetes than did the other soils. The actinomycetes which had previously antagonized bacteriophages were the least active against the pathogenic fungi but this may have been due to the fact that one-year old cultures were being compared with fresh isolates. The actinomycetes contained a higher percentage of antagonistic forms than did the bacteria. Fungi were intermediate.

The diffusion method of assaying the activity of liquid culture filtrate appeared to be more sensitive than the agar-dilution method.

[73] 631.461 : 632.953

POCHON, J.; LAJUDIE. Action de certaines substances nematocides et insecticides sur la microflore normale du sol. **[The effect of certain nematocides and insecticides on normal soil microflora.]** *Ann. Agron.* 18, 1948 (449-451). [F.] [Inst. Pasteur, Paris]

Modern antiseptics such as hexachlorocyclohexane, D-D and ethylene bromide have a much more specific effect than the older antiseptics; they have no antiseptic effect on the principal groups of soil micro-organisms, but have a definitely stimulating effect on those concerned with fixation and conversion of NH_3 to nitrite.

[74] 631.461.1/3 : 547.458.84

SHRIKHANDE, J. G. **The biological decomposition of green manures. IV. Loss of lignin during aerobic fermentation.** *Indian J. Agric. Sci.* 17, 1947 (32-33). [Imp. Inst. Sug. Tech., Cawnpore]

Loss of lignin was small during a period of 5 weeks and during longer periods of fermentation up to 6 months the losses of lignin were only about one-third of those of cellulose and hemicelluloses. In tannin materials loss of lignin was almost negligible.

[75] 631.461.1/3 : 631.432.2

BARTHOLOMEW, W. V. **Some investigations of the influence of moisture content and temperature on the biological decomposition of mature plant materials.** *Iowa St. Coll. J. Sci.* 22, 1947 (3-4).

An equation is given expressing the relationship between the moisture content of the materials and the relative humidity. Absorption of moisture is more rapid at high than at low temperatures. The rate of decomposition increases with rise in moisture content and is inhibited when the content is very low. The threshold moisture condition for active microbiological growth was 20% and the relative humidity was 75-80% for lucerne. For Sudan grass the figures were 14-16% and 77-82%, for oat straw and hemp bark 15-17% and 77-82%, for pine needles 15-17% and 80-86% and for Sudan grass roots 10-12% and 80-86%. When the atmosphere is not saturated, increases above the threshold values result in a rapid and proportional increase in microbiological decomposition, but when saturation point is reached, successive increments of moisture diminish the decomposition.

[76] 631.461.3

LEES, H. **Intermediates in soil nitrification.** *Nature* 162, 1948 (702). [Imp. Coll. Trop. Agric., Trinidad]

Fresh soil percolated with an ammonium salt and $KClO_3$ produces no nitrate, but only nitrite because the chlorate ion selectively inhibits the proliferation of the nitrite-oxidizing micro-organisms. To test if hydroxylamine or hydrazine is an intermediate in nitrite formation, soil was percolated with hydroxylamine + chlorate and with hydrazine + chlorate. The results do not prove that neither hydroxylamine nor hydrazine is an intermediate in the first stage of soil nitrification; they suggest that neither compound acts as such when added extracellularly. If it is true that hyponitrite is an intermediate and that CO_2 is essential in soil nitrification, then there is a distinct possibility that the first recognizable step in nitrification in soil is the dismutation of ammonium bicarbonate into hyponitrite and formaldehyde.

[77] 631.461.52 : 631.432.21

ALBRECHT, W. A. **Viable legume bacteria in sun-dried soil.** *J. Amer. Soc. Agron.* 14, 1922 (49-51).

[78] 631.466.1

SPARROW, F. K. **Soil phycomycetes from Bikini, Eniwetok, Rongerik and Rongelap atolls.** *Mycologia* 40, 1948 (445-453). [Univ. Michigan]

Phycomycetes isolated from a series of 44 soil samples are described. Several species of the genus *Rhizophlyctis, Olpidium Rhizophlyctidis* and *Rhizophidium marshallense* were found.

631.47 SURVEYS

(*See also* Abs. Nos. 22, 279)

[79] 631.47 : 34
BELL, A. F. **The development of agricultural resources.** *J. Aust. Inst. Agric. Sci.* 14, 1948 (51-52).

Queensland is cited as providing a profitable example of simplified co-ordination by setting up under the provisions of The Land and Water Resources Development Act of 1943 a Bureau of Investigation consisting of representative officials from all departments interested in land utilization and conservation of natural resources.

[80] 631.471 : 778.35
SMITH, H. T. U. ET AL. **Symposium of information relative to users of aerial photographs by geologists.** *Photogramm. Engng.* 13, 1947 (531-628). Amer. J. Sci. 246 (720).

The first topic, which is treated in nine articles, includes the utilization of aerial photographs in geologic mapping and research as applied in soil- and reconnaissance-mapping. There are also papers explaining reconnaissance-mapping methods from oblique photographs and describing the multiplex method of map compilation from vertical photographs.

[81] 631.472.005
SHAIN, S. S. [**Measurement of the quantity of grass roots in the soil.**] *Sovet. Agron.* No. 10, 1948 (86-91). [R.]

An apparatus is described for taking a soil monolith with a complete grass plant growing in it, that would enable the grass roots to be examined *in situ*. The apparatus consisted of a bottomless box with steel sides, the lower ends of which are sharpened, and a lid. The box is plunged into the soil and brought up again with the monolith inside.

631.48 SOIL FORMATION

(*See also* Abs. No. 358)

[82] 631.48 : 551.58
GAUCHER, G. Sur la notion d'*optimum climatique* d'une formation pédologique. [**The idea of a climatic optimum for soil formation.**] *C.R.* 227, 1948 (290-292). [F.]

In saline soils, climatic optimum results in a sort of equilibrium which is established between the circulation and stagnation of water and which causes dissolution of various substances in certain zones and their deposition in others. In calcareous crusts, climate causes an equilibrium which produces extreme mobility of lime. In red soils, climatic optimum causes not only movements of substances but also alteration of minerals.

[83] 631.483 : 549
JACKSON, M. L.; TYLER, S. A.; WILLES, A. L. ET AL. **Weathering sequence of clay-size minerals.** *J. Phys. Coll. Chem.* 1948 52 (1237-1260).

A stability series or weathering sequence for clay-size minerals in soils is presented, the order being: gypsum; calcite; olivine; hornblende; biotite, glauconite, etc.; albite, etc.; quartz; illite, muscovite, etc.; hydrous mica intermediates; montmorillonite; kaolinite, halloysite; gibbsite, boehmite; haematite, goethite; anatase, rutile, etc. Examples of the occurrences in soils are given, ranging from young soils on glacial drift to (old) laterite soils in tropical regions. It is shown that there is a close correlation between crystal structure and stability, the order with silicates being: independent SiO_4 groups < chains and bands < frameworks (feldspars) < linked tetrahedra (quartz) < sheets. The association of alumina sheets with silica sheets confers greater stability as in the common clay minerals. In the early stages one or two minerals are usually dominant in the clay, the others decreasing in amount with remoteness in the sequence. One or more stages may be absent, especially those occurring after quartz.

The rate of weathering is postulated as a product of an intensity factor (temperature, water, oxidation, etc.) by a capacity factor (specific surface, nature of mineral). The sequence proceeds under increasing acidity

and oxidation: arrest may occur under conditions of deficient leaching and reversal takes place in sediments.

The mineral composition of soil clays follows the weathering sequence geographically and in accord with the variation in intensity factors as controlled by climate and time. The rate of weathering increases with decreasing particle size, but beyond the illite stage specific surface is less important than the lattice factor. A discussion of podzolization and lateritization indicates that the first occurs under reducing surface conditions, the second under good oxidation. There should be a complete gradation from podzolization to lateritization and intermediate stages such as podzolic-laterite can occur. The gradation is illustrated by the decrease in the quartz content of a series of soils and soil clays. Red and yellow podzolic soils are considered to have developed on previously formed "lateritic" soils.

It is suggested that soils in general have not reached a steady state, as required by Marbut's concept of the *normal* soil, but are slowly advancing through further stages in the weathering sequence.—A.M.

631.5 CULTURAL OPERATIONS

(*See also* Abs. Nos. 56, 263, 282)

[84] 631.512

KURON, H. **[Depth of furrow and loosening of sub-soil. I.]** *Deut. Landw. Mitt. D.L.G.* 2, 1948 (10-11). B.A.BIII, 1948 (312). [G.]

Deep ploughing is usually advantageous and increases crop yields except where the subsoil prevents rapid drainage.

[85] 631.544.7 : 631.416.13

MOOERS, C. A.; WASHKO, J. B.; YOUNG J. B. **Effects of wheat straw, lespedeza sericea hay, and farmyard manure, as soil mulches, on the conservation of moisture and the production of nitrates.** *Soil Sci.* 66, 1948 (307-315). [Tenn. Agric. Expt. Sta.]

Effects were studied on a loam and a silt loam in lysimeter tanks for 3 years. In the loam losses of soil moisture in the first year were 42.3% of the total rainfall for unmulched tanks, 12.4% for straw mulch, 30.5% for sericea-hay and 36% for manure mulches; in the silt loam losses were 40.9, 16, 25.2 and 34.8% respectively. In the second year the effectiveness of the mulches was much reduced and manure mulch was ineffective. In the third year, effects from straw and sericea were barely evident.

Straw mulch greatly reduced the production of nitrates in both soils. In the 3-year period on the loam 81.7 lb./acre of N was obtained from untreated tanks, 56.8 from straw-mulched, 177.9 from manure-incorporated and 173.1 from sericea-hay-mulched tanks. On the silt loam figures were 74.4, 47.9, 155.6 and 155.7 respectively. On the manure-incorporated plots, straw mulch reduced total nitrate N to 130.7 lb. on loam and to 88.1 lb. on silt loam, and sericea-hay mulch increased it to 260.8 lb. on loam and 200 lb. on silt loam. The amount of nitrate N obtained from manure-mulched tanks was only slightly less than that from manure-incorporated tanks for each of the 3 years. The straw-mulch effect in depressing nitrate production is attributed primarily not to the exclusion of soil-air supply, but to soluble derivatives leached into the soil.

[86] 631.547.1 : 633.366

MCCALLA, T. M.; DULEY, F. L. **Stubble mulch studies: effects of sweetclover extract on corn germination.** *Science* 108, 1948 (163).

On testing the effect on germination of the water extracts of various plant materials including sweet clover, it appeared that the growth of maize seedlings was reduced even with a dilution of 1 part of sweet clover to 100 parts of water and that the results with coumarin showed that the coumarin in sweet clover may be one of the factors that caused inhibition of germination and growth in maize seedlings. It is concluded for these and other results that many plant residues contain substances which may, under certain conditions, retard or inhibit germination and growth of plants in the seedling stage. The effect of these substances may be entirely different, however, under field conditions from that in relatively pure cultures.

[87] 631.547.2 : 539.16

FRENCH, C. B. **Stimulation of plant growth by radioactive materials.** *Canad. Chem.* 33, 1948 (225-226). B.A.BIII, 1948 (249).

Carrots, tomatoes, potatoes, cabbages and beans gave improved yields when test plots were treated with measured amounts of radioactive fertilizers following normal application of standard fertilizers.

[88] 631.557 : 551.58
PAAUW, F. VAN DER. Periodiciteit in opbrengsten, vruchtbaarheid van de grond en klimaat. [**Periodicity of crop yields, soil fertility and climate.**] *Landbouwk. Tijdschr.* 60, 1948 (83-92). [Du.e.] [Landbouwproefsta. Bodemk. Inst. T.N.O. Groningen]

Significant rhythmical fluctuations of pH, water-soluble P and exchangeable K, determined yearly at harvest, were observed in the north and east of the Netherlands. Fluctuations in crops followed a course parallel to those of soluble P and exchangeable K; correlation between the variations of pH and yield was negative. A periodicity in average yield was shown over the years 1900-1944; it is suggested that periodicity of yields depends partly on periodicity of soil fertility, although it is probable that periodicity of climate is a ruling factor. Indication of rhythmical variations of climate, especially during the growing period, were noted.

[89] 631.58 : 631.312.5
PIGGOTT, R. **Mulch farming.** *J. Dept. Agric. S. Aust.* 52, 1948 (39).

Mulch farming prevents loss of soil by wind, minimizes dust storms and water erosion and prevents soil settling down hard after heavy rain. It allows free entry of rainfall into soil, puts body into sandy soils and makes clayey soils more open and workable.

[90] 631.581 : 631.432.2
EVLIYAR, H. Ortaanadolu topraklarinda "Su" ve Ziraat sisteminde "Nadas-Gübre" problemi. [**Water and the fallow-manure problem in Central Anatolia.**] *Ziraat Dergisi* 9, 1948 (3-13). [Tu.]

In the dry-farming region of Central Anatolia, water has commonly been regarded as the limiting factor. In 1940 the author suggested that the role of water was to enable soil bacteria to transform potential nutrients into an available state. Pot experiments indicate that even the scanty rainfall is ample for the highest yields obtained; both the bountiful crops of 1946, produced by abundant spring rain falling after a year of severe drought, and the crop failure in 1947 due to scanty spring rains after a promising start—with the failure much more pronounced where the grain had been sown on stubble—suggested that water might not be the limiting factor. Experience on State grain farms, where crops had been grown for several successive years on originally virgin soil without perceptible diminution in yield, pointed to the same conclusion.

During the period 1939-47, field trials were carried out to compare continuous cropping with alternate fallow, and manured with unmanured plots. Normal dry-farming methods (cropping one year in two) gave an average yield of 6.7 cwt./acre, whilst continuous cropping gave 5.0. On a field manured with dung, or with ammonium sulphate and super. in 4 out of 8 years, the average yield was 15.1: even in the drought year of 1944/5 (rainfall 244 mm.), when crops failed almost universally, a yield of 11.3 was obtained.

The author concludes from these trials that water is not the limiting factor, that the fallow is effective by increasing biological activity and that, with suitable manuring, satisfactory crops can be raised annually.
—T.V.

[91] 631.589
SEWELL, T. G. **Burning of montane tussock grassland.** *N.Z.J. Agric.* 77, 1948 (263-269). [Ass. Inst. Agric., Christchurch]

The deterioration of montane tussock grassland has been attributed to the practice of burning, overstocking by sheep and rabbit infestation. Burning partly kills the tussocks, removes the protection of the old leaves and permits stock to graze on the new leaves. It may be two or more years before the micro-climate redevelops sufficiently for the germination of seed.

631.62/7 DRAINAGE. IRRIGATION

(*See also* Abs. Nos. 14, 324)

[92] 631.62
MILLER, D. G.; MANSON, P. W. **Essential characteristics of durable concrete drain tile for acid soils.** *Agric. Engng.* 29, 1948 (437-441). [Univ. Minn.]

[93] 631.67 : 631.347.24
DAVIS, E. H. **The development of irrigation in Georgia.** *Better Crops* 32, 1948 (17-23, 45-46).

The majority of irrigation systems in Georgia are of the sprinkler type which, in areas of flowing wells where the soil is of the sandy loam type and the land is undulating, is the most practical and efficient form of irrigation. A recently developed long-range sprinkler which irrigates two to three acres per setting may mean low-cost irrigation of pastures and hay crops. Trial runs are being made with the application of liquid fertilizer through irrigation systems on various crops such as tobacco, maize and cabbage, and complete fertilizers, soluble in water, will be tried out in connexion with the irrigation of orange and grapefruit groves in Florida.

[94] 631.671
LONG, J. D. **The upper salinity content in water for irrigation.** *Water and Water Engr.* 50, 1947 (398). Biol. Abs. 22 (1197).

For irrigation a maximum of 700 p.p.m. of dissolved solids in which NaCl predominates is suggested. Beets, couch grass and lucerne are tolerant of salt. Beans, onions and peach trees are injured by low concentrations.

2053

631.8 FERTILIZERS

(*See also* Abs. Nos. 63, 195, 224, 225, 226, 253, 348)

[95] 631.81
HORNER, C. K. **Fertilizer industry in Japan and northern and eastern Europe.** *Foreign Commerce Weekly* 28, No. 11, 1947 (6-7, 33-35). C.A. 42 (7908).

The survey covers Japan, Czechoslovakia, Norway, Sweden, Poland and U.S.S.R.

[96] 631.81 : 545
HILL, W. L. **Report on moisture in fertilizers.** *J. Assoc. Offic. Agric. Chem.* 31, 1948 (234-236). [Bur. Pl. Indust., Beltsville, Md.]

Techniques for the determination of free moisture in fertilizers by the air-flow method and by vacuum drying are described in detail.

[97] 631.81 : 631.459 : 631.61
SANDERS, J. T. **Suggested permanent soil and water-use program and the probable role of fertilizers in it.** *Amer. Fert.* 109, 1948, No. 4 (7-8, 20), No. 5 (9, 24-28).

Expansion of food production during the last 100 years was always on drier soils where fertilizer is not likely to play a major role in future ; expansion during the coming century must be on more humid soils where fertilizers will play an expanding part in increasing food production. In these areas water limits the use of fertilizers to a much greater extent than it does on the prairie soils of the world, and soil and water conservation becomes a vitally limiting factor in potential expansion of fertilizer use.

631.811 PLANT NUTRITION

(*See also* Abs. Nos. 11, 284)

[98] 631.811
HALLIDAY, D. J. **A guide to the uptake of plant nutrients by farm crops.** *Jealott's Hill Res. Sta. Bull.* 7, 1948 pp.34

[99] 631.811
WALLACE, T. **Nutrition of farm crops.** *Farming* 2, 1948 (335-338). [Long Ashton, Bristol]

[100] 631.811 : 539.16
AEBERSOLD, P. C. **Isotopes available for research.** *Proc. Auburn Conf. Radioactive Isotopes Agric. Res.* 1948 (23-42).

The value of isotopes in the study of the rate and efficiency of uptake by crop plants of any essential element and in the differentiation between the uptake of an element which already exists in the soil and the uptake of that added in fertilizer is briefly mentioned.

[101] 631.811 : 631.415.3
REIFENBERG, A. **The influence of salt solutions on the intake of ions by barley seedlings.** *C.R. Conf. Pédol. Méditerr. 1947,* 1948 (434-442). [E.] [Hebrew Univ., Jerusalem]

Barley seedlings were grown in saline irrigation water at different dilutions and with varying additions of N, P and K. The water contained 1927 p.p.m. of Na, 3553 p.p.m. of Cl and lesser quantities of other

common cations and anions. The water was diluted to obtain 35, 350, 1750 and 3000 p.p.m. of Cl. Nutrients were added in the form of KNO_3 and KH_2PO_4.

Na did not impede the intake of K by the plant, but K did impede the intake of Na. Similarly, Cl did not impede the intake of PO_4, but PO_4 did impede the intake of Cl. The intake of NO_3 was not affected by NaCl. It is possible, therefore, that fertilizing with P and K may reduce the toxic action of NaCl in irrigation water, but as these experiments lasted only 3 weeks it is necessary to make experiments over longer periods. The general conclusion drawn from analyses of the seedlings was that it was not salt accumulation as such, but the one-sided predominance of certain ions that may cause crop damage under natural conditions.

In another experiment barley was grown in single-salt solutions of NaCl, KCl, NH_4Cl, $Ca(NO_3)_2$ and K_2SO_4. More cation than anion was absorbed from K_2SO_4 and NH_4Cl, and more anion than cation from $Ca(NO_3)_2$. At concentrations below 0.05 n. anions and cations were absorbed equally from NaCl and KCl, but at higher concentrations more anion than cation was absorbed. Whenever intake of anion exceeded that of cation electrostatic equilibrium was maintained by the respiratory activity of the plant which gave up HCO_3 ions to the solution. It is suggested that this formation of bicarbonates by plants may be a cause of the alkalinization of saline soils.

[102] 631.811.2 : 539.16

SPINKS, J. W. T. **Tracer applications.** *Canad. Natl. Res. Counc. At. Energy Project Div. Res. N.R.C.* 1682, 1946, pp.11. C.A. 42 (4844).

Uptake of phosphate for fertilizers.

[103] 631.811.2 : 539.16

HAWKINS, A. **Radioactive phosphorus fertilizer tests.** *Amer. Fert.* 109, 1948 (11).

Radioactive P at rates of 40 and 120 lb./acre of P_2O_5 were added to fertilizer applied to potatoes. With an increase in the amount of P in the fertilizer the potatoes took up a larger amount of P. On a soil low in readily soluble P, 26.7% of the total P in the plants had been adsorbed from the 40 lb. application and 51.5% from the 120 lb. application 5 weeks after full bloom. On a soil of medium P content, the figures were respectively 13% and 26%. At earlier sampling dates, potatoes had obtained a higher proportion of their P from the fertilizer than at the later date, indicating that potatoes may be largely dependent on applied fertilizer early in the season. Later in the season the crop can obtain an increasing proportion of P from the soil.

[104] 631.811.2 : 539.16

HENDRICKS, S. B.; DEAN, L. A. **Applications of phosphorus of mass thirty two to problems of soil fertility and fertilizer utilization.** *Proc. Auburn Conf. Radioactive Isotopes Agric. Res.* 1948 (76-89).

Tracer techniques involving P^{32} in problems of fertility of soil with respect to P and the availability of P fertilizers when applied to soils are illustrated by laboratory, field and growth-chamber experiments. Uniform distribution of P^{32} in the fertilizer can be accomplished by having it present in the liquid phase during formation of the fertilizer. Results of a growth-chamber experiment in which P^{32} was included at three levels in each of three fertilizers on three soils with different phosphatic fertility levels showed that there was no significant interaction of rates with soils or types of fertilizers and no significant differences between the low rate of 0.075-millicuries per 3-kg. pot and the high rate of 1.875-millicuries per pot for initial activity. The rate of 0.30 millicuries of P^{32} per g. of P_2O_5 in the fertilizer has been adopted for field experiments. No support is lent to the claim that plant growth is stimulated by irradiation.

Application of the tracer technique to problems of P utilization is illustrated by pot experiments in which P^{32} was incorporated with three phosphatic fertilizers. These were applied to three soils of different P levels that were then cropped to perennial rye grass. Results showed that the magnitude of the percentage of P contained in the crop that was derived from the fertilizer was inversely related to the relative P fertility status of the soils but was unrelated to dry weights or total P^{31} absorbed,

Field experiments with maize, cotton, tobacco and potatoes showed the amounts of native and applied P absorbed by the crop at various growth stages. This varied with the crop.

The phosphate on mineral surfaces may be studied by means of a method based on the reaction

Surface phosphate — $P^{31}+P^{32}$ (solution) $\rightleftharpoons$
Surface phosphate — $P^{32}+P^{31}$ (solution).

Measurements of the rate of this reaction showed that the concentration of P32 changed at first logarithmically with respect to time and later linearly. This indicates an apparent first-order reaction, which is interpreted as corresponding to the surface exchange, followed by a zero-order reaction whose nature is at present unknown. The region in which departure from a logarithmic rate is evident can be taken as a measure of the more readily exchangeable phosphate.

[105] 631.811.2 : 539.16
HILL, W. L.; FOX, E. J.; MULLINS, J. M. **Preparation of radioactive phosphate fertilizer for plant-utilization tests by tracer methods.** *Amer. Fert.* 109, No. 3, 1948 (22-24). [Bur. Pl. Indust., Beltsville, Md.]

[106] 631.811.2 : 631.821.1
HAWKINS, A.; TERMAN, G. L.; JUNKINS, J. C. **Liming and rate of phosphorus tests.** *Amer. Fert.* 109, No. 7, 1948 (26).

On 2 soils of pH 4.3 and 5.0, ground limestone was broadcast at 3000 lb./acre and harrowed in prior to planting potatoes. P was applied at 60, 120, 180 and 240 lb./acre of P_2O_5 on different plots, all of which received N and K equivalent to 2000 lb./acre of 6-0-10. Liming did not increase the efficiency of the P applied, nor were potato yields higher on the limed plots than on the unlimed plots. No potato scab was found in limed plots.

On a soil low in P, yield increases were obtained for all rates of P applied; on a soil medium in P, yields increased only up to 180 lb. of P_2O_5.

[107] 631.811.2 : 631.85
STRZEMIEŃSKI, K. **Soil phosphate uptake as influenced by phosphatic fertilizer.** *Nature* 162, 1948 (932). [D.S.I.R. Wellington, N.Z.]

Perennial rye-grass was sown in immature red-brown loam and strongly podzolized yellow earth, both very poor in available P. Primary calcium phosphate labelled with radioactive P was used as fertilizer in amounts equivalent to 100 kg./ha. of P_2O_5. Plants receiving P fertilizer took up 3-8 times as much P_2O_5 from the original soil as did the controls.

[108] 631.811.4
TOMPOS, A. [**Experiences in lime treatment of soils.**] *Agrártudományi Szemla* 2, 1948 (106-109). C.A. 42 (9023).

It was concluded from the examination of 700 soil samples that the results of investigations on a single sample should not be accepted for large areas. Before liming, the pH value of all plots should be determined and separate soil samples taken from any plots showing pH values below 6.8.

[109] 631.811.7 : 581.192.6
YANKOVITCH, L. Étude sur la résistance de certaines cultures d'été aux chlorures. [**A study of the resistance of certain summer crops to chlorides.**] *C.R. Conf. Pédol. Méditerr. 1947*, 1948 (407-420). [F.]

Plants were grown in healthy soil without chloride until just before flowering when NaCl was added in amounts ranging from 0 to 6.5 g. per kg. of dry soil. Yields were variable, but it was possible to conclude that wheat, sorgo and pimento benefited from 0.1% of chloride in the soil, but suffered if more was present. Yields of other plants suffered at all concentrations of chloride. The mortal dose of NaCl in the soil varied from 2.35 g./kg. for haricot beans to 5.60 g./kg. for tomatoes.

[110] 631.811.9 : 546.621
CHENERY, E. M. **Aluminium in the plant world. I. General survey in dicotyledons.** *Kew Bull.* 1948, No. 2 (173-183).

Al-accumulating species are listed and the "Aluminon" test for Al-accumulation in plants is described.

631.82 MINERAL AMENDMENTS. LIME

(*See also* Abs. No. 106)

[111] 631.821.1
TAYLOR, H. F. **Relative merits of ground limestone and quicklime for agriculture.** *Mem. Proc. Manchester Phil. Soc.* 87, 1945-1946 (127-133). B.A.BIII, 1948 (315).

$CaCO_3$ as ground limestone is equal to quicklime in cost per unit of available CaO; its rate of dissolution is not less than that of CaO, it is easier to handle, is harmless to plants and animals and can be distributed evenly.

[112] 631.821.1
TIEDJENS, V. A. **How much lime should we use?** *Better Crops* 32, No. 7, 1948 (17-20, 47-49). [Truck Expt. Sta. Norfolk, Va.]

To enable roots to penetrate through the dense plough sole of the Coastal Plain soils large amounts of lime are necessary. On these sandy soils much overliming injury is due to poor drainage and aeration. Once the soil is in good condition it makes little difference where the fertilizer is placed so long as it does not injure the roots and is deep enough for the roots to reach it.

[113] 631.822
BRÜNE, F. Die Nutzbarmachung des Seeschlicks in der Landwirtschaft. [**The agricultural utilization of estuary mud.**] *Ztschr. Pfanz. Düng.* 37, 1946 (197-205). [G.]

Estuary mud contains great quantities of plankton which perish in the mingled fresh and salt waters. About 2½ million cubic metres are dredged annually from the Bremerhaven area alone. The mud, which has been used for many years in coastal districts, is "an extremely valuable aid in improving the yielding capacity of all light soils, especially those of moorlands and sandy heaths". From the economic point of view, its use on a large scale would require public subsidy. The colloidal mass is heaped for 3-9 months and then, with a water content of about 50%, is transported to farms and spread when crumbly at a rate of at least 16 cubic metres/ha. Over 100 c.m./ha. may be applied without ill effect. It contains about 0.3% of N, 7% of CaO, 0.7% of K_2O, 1.8% of MgO and 0.2% of P_2O_5, the lime content being very finely divided. Its physical effect is at least as great as its chemical, in raising the soil's power to retain water and to absorb nutrients. Residual effects have been noticed after 8 years. Supplemental fertilizing is required. On virgin or newly exploited land 300 kg./ha. of 40% K salt + 600 kg./ha. of basic slag should be applied yearly for medium crops, and 200-300 and 300-400 kg./ha. respectively on long-cultivated soil, with N as required. For every 50 c.m. of mud above the first 50 c.m. the PK application may be reduced by 10%.

[114] 631.828 : 546.73 : 619
BROUWER, E. **Cobalt deficiency in Denmark.** *Maandbl. Landbouw* 4, 1947 (341-343). B.A.B.III, 1948 (314).

On the whole of the Danish peninsula, but not on the islands, there are occurrences of calves difficult to rear, especially where cultivation has been most intensive. The sickness was prevented by administration to each animal of 0.5-1.0 mg. of Co per day. Application in fertilizers of $CoCl_2$ at 2 kg./ha. is also advocated. Similar results ascribed to Cu have been due to traces of Co.

631.83 POTASSIUM FERTILIZERS

(*See also* Abs. No. 24)

[115] 631.83 : 581.192
SAYRE, C. B. **Hardening plants with potash.** *Amer. Fert.* 109, No. 10, 1948 (9, 26). [N.Y. Agric. Expt. Sta., Geneva]

The hardening effect of K on vegetables is illustrated by an experiment in which treatment with K produced stiff, stocky tomato plants of good quality for transplanting as opposed to the tall, succulent plants resulting from treatment with N and P alone. Applications of K also hardened cabbage plants which were making too soft and rank a vegetative growth.

631.84 NITROGEN FERTILIZERS

[116] 631.84 : 631.544.7
MOOERS, C. A.; WASHKO, J. B.; YOUNG, J. B. **Effect of straw mulch on recovery of nitrogen from nitrate of soda and ammonium sulfate applied as top-dressing.** *Soil Sci.* 66, 1948 (399-400). [Agric. Expt. Sta., Univ. Tennessee]

In this lysimeter experiment full recovery of the applied nitrate was obtained from the unmulched tanks, but under straw-mulch conditions the average recovery was only 73.4%. In the case of $(NH_4)_2SO_4$ the unmulched tanks showed an average recovery of 65.6% and the straw-mulched 51%. The straw mulch reduced the availability of the N in both carriers. The judicious use of $NaNO_3$ appears to be warranted as a means of overcoming the detrimental effects of the straw mulch.

[117] 631.841.5

TEMME, J. **The transformation of calcium cyanamide in the soil.** *Plant and Soil,* 1, 1948 (145-166). [Agric. Coll. Wageningen]

$CaCN_2$ in soil is converted to ammonia in the following stages: (1) $CaCN_2$ is hydrolysed to cyanamide and $Ca(OH)_2$, (2) cyanamide is hydrolysed to urea, (3) urea is converted by micro-organisms to $(NH_4)_2CO_3$. In the decomposition of cyanamide micro-organisms in the soil do not play any part before the formation of urea by physico-chemical means. In the Netherlands the slow-acting fertilizer $CaCN_2$ is mainly used as a weed-killer. If it is left for only a short time on the soil surface it acts as a weedkiller and a supplier of N.

[118] 631.841.8

ANDREWS, W. B. **Anhydrous ammonia as source of fertilizer nitrogen.** *Agric. Chem.* 3, 1948 (25-27, 77-81).

The properties, use and application of and crop response to anhydrous ammonia used as fertilizer are discussed.

[119] 631.841.8

ANDREWS, W. B. **The use of anhydrous ammonia as a source of nitrogen.** *FAO Europ. Bull.* 7, 1948 (542-543). [Miss. Sta. Coll. Agric.]

[120] 631.842.3 : 631.811.9

BAEYENS, J. **Physiological effect of minor elements in Chilean nitrate.** *Plant and Soil* 1, 1948 (135-144). [Univ. Louvain]

Chilean nitrate has a more favourable effect than other forms of N fertilizers on fodder beets and sugar beet, probably because it contains B and other minor elements. Heartrot disease is less with Chilean nitrate than with other N fertilizers.

[121] 631.842.4 : 631.812

HOOGSTRATEN, C. W. VAN; ROWAAN, A. P. **Fertilizers containing ammonium nitrate as a cause of fire.** *Maandbl. Landbouwvoorl. Dienst* 4, 1947 (397-399). B.A.BIII, 1948 (313).

Examination of the circumstances of two fires on farms in the Wieringermeer showed the causes to be the storage of NH_4NO_3 in an old $Ca(H_2PO_4)_2$ sack and the stacking together of sacks of NH_4NO_3 and $Ca(H_2PO_4)_2$. Free H_3PO_4 causes the decomposition of NH_4NO_3 that sets on fire combustible material such as straw or sacking. This combination of materials is sensitive to temperature and can ignite spontaneously under suitable conditions.

[122] 631.847.2

LEMMERMANN, O. Die Prüfung und Beurteilung der Bacterien-präparate für die Impfung der Leguminosen und Nicht-leguminosen. **[The testing and evaluation of bacterial preparations for inoculation for legumes and non legumes.]** *Ztschr. Pflanz. Düng.* 38, 1947 (80). [G.]

In pot tests, 6 different inoculants produced yields of serradella varying from 5.6 to 72.7 gm./pot. The yields of uninoculated serradella (1) without N and (2) with 0.4 gm. of N fertilizer per pot were (1) 4.9 gm. and (2) 92.8 gm. Peas showed somewhat similar variations in yields. It is stressed that, as with commercial fertilizers, a statement of the experimentally determined activity of a given commercial inoculant should be available before use.

[123] 631.847.2 : 633.32

KRASILNIKOV, N. A.; KORENIAKO, A. I. **Influence of nodule bacteria on nitrogen fixation in clover under sterile culture conditions.** *Mikrobiologia* 15, 1946 (279-284). C.A. 42 (9025).

Inoculation of clover roots with *Rhizobium trifolii* did not lead to significant N fixation and growth acceleration until 4-6 weeks after nodule formation.

631.85 PHOSPHATE FERTILIZERS

[124] 631.85 : 581.192

MATRONE, G.; WEYBREW, J. A.; PETERSON, W. J. ET AL. **Studies of the biological measurement of the nutritive value of forage plants as influenced by fertilization.** *Amer. Fert.* 109, No. 4, 1948 (9-10). [U.S.D.A. and N.C. St. Coll., Raleigh]

On forage fertilized with P significant gains in weight of young rabbits and lambs were obtained only when cerelose (corn sugar) was fed as a part of the ration.

[125] 631.85 : 631.821.1 : 631.432.3
MacIntire, W. H.; Shaw, W. M.; Robinson, B. **The migrations of phosphorus and associated elements from incorporations of various fertilizer phosphates and supplements of liming materials and calcium fluoride.** *Amer. Fert.* 109, No. 3, 1948 (20-22). [Agric. Expt. Sta., Knoxville, Tenn.]

12-year findings on rainwater leachings of P, Ca, Mg, K, N, S and Fl are summarized. Leaching of Ca was not increased by either dolomite or rock phosphate; leaching of Mg was decreased by limestone and increased by dolomite; leaching of K was decreased by both limestone and dolomite.

[126] 631.85 : 632.951
MacIntire, W. H.; Winterberg, S. H.; Hardin, L. J. et al. **Analytical evaluation of certain synthetic organic phosphates in relation to their fertilizer effectiveness in pot cultures.** *Soil Sci.* 66, 1948 (249-257). [Tenn. Agric. Expt. Sta.]

The P content and fertilizer value of the insecticides H.E.T.P. (hexaethyl tetraphosphate) and T.E.P.P. (tetraethyl pyrophosphate) were tested. In concentrated form both are devoid of PO_4, are decidedly stable and undergo hydrolytic change rapidly in high dilution. When they undergo conversion to H_3PO_4 they lose their insecticidal values and acquire fertilizer effectiveness. The monoethyl acid orthophosphate alone showed incidence of PO_4 initially, yet only 64% of the P content in high dilution was in the ortho state after a 4-hour near-boiling digestion. When H.E.T.P. and T.E.P.P. were incorporated into the soil before seeding they could not compete with inorganic P fertilizers and their inclusion in fertilizer experimentation will probably extend only to their use as insecticides. Their efficacy as a source of nutrient P should be determined through integrated pot cultures. Their P content should be determined by means of rapid, specifically adequate technique; official methods for determining P content of fertilizers do not register the full P content of synthetic organic phosphates.

[127] 631.851 : 546.77
Robinson, W. O. **The presence and determination of molybdenum and rare earths in phosphate rock.** *Soil Sci.* 66, 1948 (317-322). [U.S.D.A.]

Tennessee and Island-phosphate rocks are rather low in Mo. Phosphate rocks from Florida and North Africa are considerably higher in Mo, generally containing more than 20 p.p.m. Some western rocks are very high in Mo. Super. retains the Mo originally in the phosphate rock. Rare earths are present in quantities ranging from 110 to 1550 p.p.m. of R_2O_3 in the samples examined.

A method for the combined determination of Mo and rare earths in phosphate rock is described. 5 g. of finely ground phosphate rock were fused with 15 g. of Na_2CO_3. Si was removed from the aqueous leachate by evaporating, taking up the residue with HCl and filtering. The solution was extracted with isopropyl ether. Mo was determined by the thiocyanate colorimetric method. The rare earths were determined in the leached residue after the extraction of Mo.

631.86/7 ORGANIC FERTILIZERS

(*See also* Abs. Nos. 49, 61, 227, 289, 318)

[128] 631.86
Orchard, E. R.; Ludorf, R. **The composition and use of Karoo manure, with notes on kraal manure, compost and Karoo-manure ash.** *S. Africa Dept. Agric. Bull.* 298, 1948, pp. 21, and *Farm. S. Africa* 23, 1948 (241-253, 317-323). [Div. Chem. Serv. Pretoria]

Kraal manure is produced in the arid and semi-arid sheep-farming areas. It is preserved in heaps and, owing to the rainfall in the Karoo rarely exceeding 15 inches, there is little loss due to leaching. The chief value of Karoo manure lies in its N; the mean content of the samples analysed, expressed on a dry basis, was 1.68%. The K_2O content was about 5% on the dry basis, but as South African soils are rich in K_2O, this constituent is of less value. The low P_2O_5 content, slightly more than 1%, reflects the widespread lack of P in South African soils and vegetation. If used for maize, Karoo manure should be supplemented with P fertilizers. It is most profitably used in fruit- and vegetable-producing areas.

[129] 631.86 : 631.879.3 : 636.086.25
White, J. W. **Comparison of sawdust and wheat straw for bedding [in cattle stalls].** *N.-E. Wood Util. Counc. Bull.* 7, 1945 (57). B.A.BIII, 1948 (156).

The rate of decomposition of cattle or poultry manure made with sawdust litter was lower than when straw was used, but the amount of nitrate and yields of maize produced was somewhat higher.

[130] 631.871 : 634.8

DROUINEAU, G.; LEFÈVRE, G. Etude analytique du compostage des marcs de raisin. [**An analytical study of the composting of grape residues.**] *C.R. Acad. Agric.* 34, 1948 (865-867). [F.] [Sta. Agron. Antibes]

Two methods of composting were compared, one analogous to the preparation of manure from straw and inorganic N with the addition of horse manure, the other according to the Roos method with the addition of lime. The difference between composting straw and grape residues lies in the relative decomposition of lignin and cellulose which are both equally decomposed during hot fermentation of grape residues, whereas there is only a slight decomposition of lignin compared with that of cellulose when straw is composted. 14 kg. of organic N were lost per ton of grape residues during composting.

[131] 631.874 : 633.3

CIDRAES, A. G. As *Vicias* e os *Lathyrus* na practica da sideração. [***Vicia*** **and** ***Lathyrus*** **species as green-manure plants.**] *Rev. Agron. Lisboa* 33, 1945, pp. 12. Herb. Abs. 18 (240). [Pt.]

Although *Lathyrus cicera* gave yields of 30,000 kg./ha. and *Vicia narbonnensis* gave 20,000 kg./ha., autumn-sown *Vicia narbonnensis* is considered a better green-manure crop as its more rapid growth enables it to be incorporated in the soil in time for spring sowing. *Lathyrus cicera* should be used for light lands or where late ploughing-under of the green manure is immaterial.

[132] 631.875

WILSON, F. B. **A system of composting farm and village waste.** *E. Afric. Agric. J.* 14, 1948 (82-85).

The collection and treatment of material where fairly large quantities of waste are available, the method of making compost and its uses in Zanzibar and Pemba are described.

[133] 631.879.1

LAL, B. N. **Some manurial trials in the United Provinces with town compost.** *Indian Farm.* 8, 1947 (289-290). [Dept. Agric. U. P.]

Town compost was more effective than an equal volume of farmyard manure. The compost contained about 0.9% of N on a dry-weight basis.

[134] 631.879.1

MARX, T. [**Refuse as a soil improver and fertilizer.**] *Deut. Landw.* 2, 1948 (5-7). B.A.BIII, 1948 (313). [G.]

Methods of utilizing town refuse as fertilizer are reviewed.

632 PLANT DISEASES AND PROTECTION

(*See also* Abs. Nos. 167, 185, 186, 199, 201, 203, 206, 230, 243, 246, 251, 252, 253, 255, 259, 263, 270, 273, 286, 291, 292, 295)

[135] 632.191

JONES, J. O. **Field methods for the diagnosis of mineral deficiencies in crop plants.** *Occ. Publ. Sci. Hort.* No. 5, 1947 (18-22). [Long Ashton]

The methods are divided into visual methods, indicator plants, foliage spraying and injection methods and the tissue-test method.

[136] 632.191 : 546.47

JAVILLIER. Les carences zinciques chez les plantes cultivées. [**Zinc deficiency in cultivated plants.**] *C.R. Acad. Agric.* 34, 1948 (176-177). [F.]

A brief survey of the Zn-deficiency diseases "little leaf" or "rosette" in apples, "mottle leaf" and "frenching" in citrus and "white bud" in cereals.

[137] 632.191 : 546.711 : 631.433

BOLAS, B. D.; PORTSMOUTH, G. B. **Effect of carbon dioxide on availability of manganese in soil producing manganese deficiency.** *Nature* 162, 1948 (737). [Imp. Coll. Sci., London]

The soil from the recently drained lake bed at East Malling, used in experiments with potatoes, is an alluvial deposit of pH 8.0-8.5, containing a large amount of $CaCO_3$ and organic matter. The soil contains ample Mn,

but the amount of Mn available to plants is small since plants occur containing less than 1 p.p.m. on a fresh-weight basis and showing acute deficiency symptoms. Attempts to reproduce these conditions using the same soil in pot cultures did not succeed in producing plants showing such marked symptoms or low Mn contents, although soil pH was maintained at 8.0-8.5 by irrigating with water saturated with $CaCO_3$.

Uniformly mixed soil was finely ground and 250-mg. portions were placed in flasks and left in contact for 48 hours with high-grade water redistilled in quartz. One lot of water was saturated with acid-free CO_2 at 20°C, another lot was boiled and a third lot was kept saturated with CO_2 during extraction. After extraction the liquid was centrifuged to remove soil particles and the pH and amount of Mn determined were:

ml. boiled water.	ml. water saturated with CO_2.	p.p.m. of Mn extracted calculated on dry soil.	pH of extract.
25	—	< 0.1	8.0-8.5
24	1	,,	,,
23	2	,,	,,
21	4	,,	,,
17	8	0.4	8.0
9	16	2.6	7.5
—	25	5.6	,,
—	25 kept saturated with CO_2.	22.0	6.0

The liberation of Mn by the local accumulations of CO_2 goes far to account for the patchy distribution of the symptoms found in the field. Local accumulation of CO_2 within the root masses may render Mn available without producing perceptible changes in the pH of the soil as a whole.

[138] 632.191 : 631.42

HEWITT, E. J. **Pot culture technique in relation to mineral deficiency investigations.** *Occ. Publ. Sci. Hort.* No. 5, 1947 (10-17). [Long Ashton]

The relative merits and disadvantages of water culture, irrigation culture and pot sand culture are discussed. The technique for large scale sand cultures for use in studying mineral deficiencies is described in detail.

[139] 632.2

VAN DER LINDE, W. J.; SMITH, A. J.; NEETHLING, L. J. **Control of eelworm.** *Farm. S. Africa* 23, 1948 (509-516, 546). [Div. Entomol.]

Eelworm can be controlled by injecting D-D into the soil to a depth of 8 inches and sealing the soil with water to prevent the fumes escaping. D-D should not be applied if the soil temperature at 8 inches is below 40° or above 70°F. Eelworm cannot survive in dry soil, and by allowing the ground to dry thoroughly by frequent ploughing in summer the infestation may be reduced considerably, but the method is expensive and exposes the soil to erosion. Infestation can be reduced by allowing lands to lie fallow and removing all weeds regularly. Rotation with resistant crops for 3-4 years reduces infestation. Eelworm is far less active in winter than in summer.

[140] 632.51 : 631.547.1

BIBBEY, R. O. **Physiological studies of weed seed germination.** *Pl. Physiol.* 23, 1948 (467-484).

The persistence of many annual weeds on the grain farms in Western Canada is closely related to the tendency of their seeds to remain viable in the soil under conditions favourable for the germination of most crop species. Tests with *Thlaspi arvense* (L.) (stinkweed), *Brassica arvensis* (L.) Ktje. (wild mustard) and *Avena fatua* (L.) (wild oats), three of the most troublesome weeds in Western Canada, showed that apparently environmental dormancy, as distinguished from "inherent" dormancy, was the major factor in their longevity. It is suggested that where aeration is sufficient, some other factor, possibly moisture, has become limiting.

[141] 632.554.21

TAMHANE, V. A.; TAMHANE, R. V. **The eradication of *Kans (Saccharum spontaneum)*.** *Indian Farm.* 8, 1947 (237-238).

Kans is a most obnoxious weed and is difficult to eradicate as it penetrates to a depth of 5 ft. and more into the soil. In an experiment at Indore the standing *kans* weeds were cut off with a scythe and the field under experiment was divided into three plots. The first was worked with an iron blade-harrow twice a week continuously for

four months, the second for eight months and the third for twelve months. After being left untouched for two years, nearly 40% of the *kans* persisted on the first plot, but not a single blade had survived after the eight- and twelve-month treatments.

[142] 632.554.22 : 632.954 : 577.17
DOMATO, J.; ARAMAYO, H. Las hormonas y sus posibles aplicaciones en la agricultura. El 2,4-D ensayado como herbicida en el control de la "Totorilla" (*Cyperus rotundus* L.). **[Hormones and their possible application in agriculture. Tests of 2,4-D in the control of nut grass (*Cyperus rotundus* L.)]** *Tucumán Esta. Expt. Agric. Bol.* 62, 1947, pp.18. [Sp.]

Single applications of up to 2000 l./ha. of 0.03-0.3% 2,4-D failed to destroy the underground reproductive parts of nut grass. The possibility of control by successive applications remains to be investigated.

[143] 632.568.32 : 632.954.6
HILLI, A. Kanankaalin levinneisyydestä ja torjunnasta. **[Spreading and control of wintercress.]** *Maat. Aikak.* 20, 1948 (48-57). [Fi.e.] [Sch. of Agric., Järvenpää]

Applications of 200-250 kg./ha. of $CaCN_2$ kill wintercress [*Barbaraea arcuata* (Opitz) Rchb.]. 100-150 kg./ha. slows down growth and reduces seeding.

[144] 632.594.92
ROE, R.; SHAW, N. H. **Mint weed, *Salvia reflexa* Homem.** *Aust. Counc. Sci. Indust. Res. Bull.* 231, 1948, pp. 16.

Results of a survey of mint weed in relation to soil and vegetation types are presented. The geographical distribution in Southern Queensland is shown on a map. Experiments to discover means of controlling mint weed have not been very successful.

[145] 632.651.6
SMIT, B. **Earthworms of great benefit to soil.** *Farm. Week. S. Africa* 76, Sept.22, 1948 (54-56). [Division of Entomol.]

Over 30 species of earthworms occur in South Africa, many of which seem to have been introduced unintentionally on plants. They are not as abundant as in countries with greater rainfall. Where plenty of decomposing organic matter is maintained in the soil by good farming methods, earthworms will multiply and there is no need to introduce them from U.S.A. where earthworm farming is carried on. Introduction of new species might upset the existing favourable balance. For the control of worms, grubs and termites in bowling greens, the grass may be treated with 1 oz./sq.yd. of lead arsenate or calcium arsenate mixed with the top dressing and watered so that it penetrates the soil. Effects of this treatment last several years. A quicker and less permanent method is to fumigate the soil with CS_2.

632.95 FUNGICIDES. INSECTICIDES. HERBICIDES

(*See also* Abs. Nos. 200, 208, 221, 295)

[146] 632.951
LOUNSKY, J. Perspective nouvelle dans la disinsectisation du sol, spécialement du point de vue des quarantaines phytosanitaires. Communication préliminaire. **[New perspective on the destruction of insect life in soil, especially from the point of view of phytosanitary quarantine. Preliminary communication.]** *Rept. First Cong. Plant Prot. Heverlee, 1946*, 1947 (418-422). R.A.E. 36A (291).

Azalea mould was immersed for 15-30 minutes in an emulsified solution containing 0.05% DDT. Samples of soil were taken immediately after treatment and 15, 30, 45 and 60 days later, and placed in contact with Tipulid larvae which showed symptoms of poisoning after 2, 4, 4, 5 and 6 days and were all dead after 9, 10, 12, 21 and 18 days respectively. Mortality in controls was 20%. The period of immersion did not affect toxicity, but the DDT acted more slowly in dry than in damp soil. This treatment would give control of pests hatching in soil balls for a period of at least two months.

[147] 632.951
MORRISON, H. E.; CROWELL, H. H.; CRUMB, S. E., JR. ET AL. **Effects of certain new soil insecticides on plants.** *J. Econ. Ent.* 41, 1948 (374-378). [Oregon Agric. Expt. Sta.]

Benzene hexachloride at the rate of 1010 lb. of the gamma isomer per 1000 cubic feet caused varying degrees of plant injury and flavoured certain vegetables. It has shown

decided promise for control of various soil pests but lack of information on its disadvantages greatly limits the possibility of its immediate acceptance for pest control.

[148] 632.953
CARTER, W. **Soil fumigation.** *Agric. Engng.* 29, 1948 (434). [Pineapple Res. Inst., Hawaii]

The uses of carbon bisulphide, chloropicrin for greenhouse and nursery beds, and DD and ethylene dibromide for wireworm control are outlined. Methods of testing are described.

[149] 632.953 : 547.414.8
STARK, F. L., JR. **Investigations of chloropicrin as a soil fumigant.** *Cornell Agric. Expt. Sta. Mem.* 278, 1948, pp. 61.

Soil conditions (texture, temperature, moisture content and compactness) influence the effectiveness of chloropicrin fumigation by their effect on (1) the distribution and concentration of chloropicrin throughout the soil, (2) the length of time the gas remains in the soil, (3) the toxic action of the fumigant, and (4) the susceptibility of the organisms. A wide range in the susceptibility of fungi was observed. Most soil-borne pathogenic fungi were found to be very susceptible to chloropicrin with the exception of those organisms which form sclerotia.

[150] 632.953 : 631.3
OWEN, R. R. **Equipment for applying soil fumigants.** *Agric. Engng.* 29, 1948 (435-436). [Calif. Packing Corp. Wahiawa, Hawaii]

[151] 632.953 : 631.432.2
LUBATTI, O. F.; SMITH, B. **Determination of fumigants. XX. Sorption of methyl bromide by potatoes.** *J. Soc. Chem. Indust.* 67, 1948 (347-354). [Imp. Coll. Field Sta., Sunninghill, Berks.]

In experiments on the fumigation of potatoes with methyl bromide in an attempt to control potato eelworm, the sorption at the end of a day's fumigation by a light loam was about 1 mg./100 g. of soil. Over the same time, potatoes had absorbed more than 3 mg. Sorption was considerable when the soil was very dry and there was at first a slight decrease followed by an increase as the moisture content was raised. As the soil approached water saturation the sorption became steady.

[152] 632.954 : 546.226
HAMBLYN, C. J. **Sulphuric acid controls weeds in onions.** *N.Z.J. Agric.* 77, 1948 (281-283).

Spraying methods and equipment devised by Manawatu growers who have obtained very satisfactory results with H_2SO_4 for weed control in onions.

[153] 632.954 : 577.17
AKAMINE, E. K. **Plant-growth regulators as selective herbicides.** *Hawaii Agric. Expt. Sta. Circ.* 26, 1948, pp. 43.

183 references are included.

[154] 632.954 : 577.17
ENNIS, W. B., JR. **Responses of crop plants to o-isopropyl N-phenyl carbamate.** *Bot. Gaz.* 109, 1948 (473-493). [Camp Detrick, Frederick, Md.]

Germinating seeds of over 50 species were planted in pots to which *o*-isopropyl *n*-phenylcarbamate was applied at the rate of 10 mg./1.7 kg. of soil. The responses of the monocots were characterized by swelling, and lack of elongation of the root and shoot. Of 39 dicotyledonous species 15 responded to the treatment and developed short thick hypocotyls and poor root systems. When applied at 0.5, 1.0 and 1.5 g./sq. yd. to wheat when the plants were 6 and 15 inches high and in the boot stage the substance reduced growth and yields, especially when applied in the earlier stages. Rice plants became stunted and dark green in colour when the carbamate was applied in the irrigation water at various stages of growth from 19-45 days. Established plants of buckwheat, tomatoes and potatoes also showed thickened stunted. growth after treatment with the carbamate.

Possible applications of the substance include its use as a herbicide, retention of pasture plants in the succulent vegetative stage, delaying maturity of rice and certain dicots and preventing fruiting.

[155] 632.954 : 577.17
NEWMAN, A. S.; DEROSE, H. R.; DERIGO, H. T. **Persistence of isopropyl N-phenyl carbamate in soils.** *Soil Sci.* 66, 1948 (393-397). [Camp Detrick, Frederick, Md.]

Isopropyl N-phenyl carbamate disappeared rapidly at soil-moisture contents of 20-80% of the water-holding capacity. After 19

days' incubation the compound had disappeared at all moisture levels except at 100% of the water-holding capacity and from flooded soil. In an experiment on the effect of temperature, there was no visible response at any temperature after 36 days' incubation. Even at the rate of 250 mg./lb. of soil this compound disappeared in 39 days ; there can therefore be no danger from over-treatment when it is used as a herbicide. The results indicate that its disappearance is due to the action of micro-organisms.

[156] 632.954 : 577.17 : 631.812
MARTH, P. C.; HARDESTY, J. O.; MITCHELL, J. W. **Stability of 2, 4-D in mixed fertilizers.** *Amer. Fert.* 109, No. 4, 1948/9). [U.S.D.A., Beltsville, Md.]

A mixture of 2,4-D and 10-6-4 fertilizer can be stored for 10 months without loss of potency.

633.1 CEREALS

(*See also* Abs. Nos. 98, 306)

[157] 633.1-1.811
RAYNS, F. **Nutrition of cereals. II.** *Farming* 2, 1948 (366-370).

Mineral deficiencies in cereal crops and their correction are discussed. Failures of cereals due to lack of trace elements are of less economic importance than those due to lack of NPK and Ca.

[158] 633.1-1.84
HALLIDAY, D. J. **Nitrogen for cereals. The response of cereals to increasing rates of nitrogen fertilization.** *Jealott's Hill Res. Sta. Bull.* 6, 1948, pp. 38.

A survey of evidence accumulated over a period of nearly 100 years from field experiments carried out at research stations and farms. The questions of lodging, when to apply N fertilizers and the effect of increasing rates of N are discussed. When cereals are grown in a rotation 2 cwt. of $(NH_4)_2SO_4$ (i.e. 47 lb. of N) per acre is not excessive on most soils. With malting barley N fertilizers used at a rate exceeding 1-1½ cwt. of $(NH_4)_2SO_4$ per acre may lower the value of the crop. Spring is the best time to apply N to winter cereals on good land. Excessive N can result in a tendency to lodging, which is usually greater on a rich soil. "Eyespot" caused by *Cercosporella herpotrichoides* is also a cause of weak straw, which is one of the reasons why lodging occurs. The development and spread of eyespot are favoured by luxuriant growth which results from excessive N.

[159] 633.11-1.416 : 581.192
SCHRENK, W. G.; KING, H. H. **Composition of three varieties of Kansas-grown wheat. Mineral analysis of wheat and soil.** *Cereal Chem.* 25, 1948 (61-71). B.A.BIII, 1948 (250).

Ash and mineral content of wheat varied with the available nutrients in the soil. High protein content was associated with high mineral content, particularly of Ca. Mineral content of both grain and soil was higher in the west of Kansas where the rainfall was least. Na, Fe, Mn and Cu showed a less definite trend across the state from west to east.

[160] 633.11-1.84-1.816.23
GARNER, H. V. **Top dressing wheat.** *Farming* 2, 1948 (268-272). [Rothamsted]

An outline is given of the history of the use of N fertilizers for wheat. In 75 experiments involving top dressings of 1-2 cwt./acre of $(NH_4)_2SO_4$, 9 showed no increase, 25 gave an increase of up to 2 cwt. of grain, 23 gave an increase of 2-4 cwt. and 18 gave over 4 cwt. Nitrate N has a small advantage over ammonia and nitro-chalk. On soils deficient in lime, $NaNO_3$ and nitro-chalk have the advantage of not further aggravating acidity. $(NH_4)_2SO_4$ may readily be mixed with other fertilizers but the other 2 are best used separately. When wheat is grown frequently in succession, 4 cwt./acre of N top-dressing is necessary. Under normal rotation cropping in drier areas, 1½-3 cwt. is sufficient. In areas of higher rainfall less is required. In grain yields, all applications from Nov. 24 to May 15 were equally effective, the early dressings increasing the number of ears per plant and the later dressings increasing the size of the grains. N applied after June 22 only increased the percentage of N in the grain. Yield of straw was increased by early dressings. Dressings applied between mid-April and the first week in May do as well in grain production as earlier dressings and produce less straw. Autumn dressings should not be applied on light soils in wet districts.

The initial level of fertility as judged by yields without N gives no sure indication as to how top dressings will behave. Because land will grow a useful wheat crop it does not follow that it should not receive a topdressing.

[161] 633.15-2.7-1.811.1
HILL, R. E.; HIXSON, E.; MUMA, M. H. **Corn rootworm control tests with benzene hexachloride, DDT, nitrogen fertilizers and crop rotations.** *J. Econ. Ent.* 41, 1948 (392-401). [Neb. Agric. Expt. Sta.]

The data do not show measurable increases in yield due to rootworm control. Available N in the soil is the key to large maize yields and root recovery, and rootworm injury may be a minor factor in reducing yields.

[162] 633.16-1.5
ŠIMON, J. Jak lze vypěstovat sladovnický ječmen dobré jakosti. [**How to grow malting barley of good quality.**] *Jednot. Svaz Česk. Zeměd.* pp. 20 [Cz.]

[163] 633.18 : 546.331.31
KAPP, L. C. **The effect of common salt on rice production.** *Rice J.* 51, No. 1, 1948 (25-29). Rev. Int. Indagr. 9 (114).

The harmful effect of salt in soils on the germination of rice and the importance of the chemical composition of irrigation water in the rice fields are discussed.

[164] 633.18-1.4-1.557
HOON, R. C.; DHAWAN, C. L.; MADAN, M. L. **The effect of certain soil factors on the yield of major crops in the Punjab. II. Rice.** *Indian J. Agric. Sci.* 16, 1946 (356-379). [Irrigation Res. Inst., Lahore]

In an attempt to correlate statistically rice yields with soil characteristics, samples were taken from the upper 18 inches of a large number of fields in two districts. Higher pH values were accompanied by lower yields in the Gujranwala but not in the Sheikhupura district. There were significant correlations between yields and the Na content of the top 9 inches of Gujranwala soil, and between yields and Ca content of the top 18 inches and the Na content of the second 9 inches of Sheikhupura soils. Yields were correlated with degree of alkalization where exchangeable Na was a limiting factor and with N content. Yields were unrelated to Mn, available-P, B and soluble-salt contents.

[165] 633.18-1.874
DIRECTOR OF AGRICULTURE, MADRAS. **Green manuring of paddy.** *Madras J. Coop.* Dec. 1947, *Indian Farm.* 9, 1948 (267-268).

The usual manures are farmyard manure, green leaves, oil cakes, bone meal, $(NH_4)_2SO_4$ and super. Supplies of most of these manures are limited. The only type which can be increased is green leaves. The average amount is about 4000 lb. or 3 cart loads of green leaves per acre, and every 40 lb. of green leaves brings about an increase of one Madras measure of paddy. There are two methods of growing green leaves; one is to raise a green-manure crop after the paddy has been harvested and plough it in before the new crop of paddy is transplanted. *Pillipesara* does well on stiff soils, *Kolinji* on light soils, sunn hemp on medium soils, *Sestania speciosa* and Dkainda (which is also particularly suited to alkaline soils) do well on all soils. The second method is to raise quick-growing shrubs on the bunds of fields. This is particularly suitable where there is not sufficient interval between the crops of paddy to raise green-manure crops for ploughing in. *Glyricidea* and *Leucaena* are particularly suitable. Each *Glyricidea* plant will give 40 lb. of leaves during the first year and up to 300 lb. a year after the third year.

[166] 633.18-2.51
KAPP, L.C .; BARTHOLOMEW, R. P. **The effect of controlling weeds by irrigation and seeding practices on rice yields.** *Rice J.* 51, No. 1, 1948 (16-18, 35-36). Rev. Int. Indagr. 9 (114).

Yield increases were obtained.

[167] 633.18-2.526
CHIAPPELLI, R. [**Algae in the rice fields in Italy.**] *Risicoltura* 36, 1948 (105-106). B.A.BIII, 1948 (321). [I.]

With increasing use of fertilizers, trouble mainly due to *Spirogyra tenuissima* and *Sphaeroplea anulina*, which cover the surface of the water and choke other growth, has increased. The best remedy was the application of $CuSO_4$ solution at a rate of 1-1.5 kg./ha. by special distributors or the irrigating pumps.

633.2 GRASSES

(*See also* Abs. Nos. 332, 336, 338)

[168] 633.2.03-1.5 : 581.144.2
WEINMANN, H. **Underground development and reserves of grasses. A review.** *J. Brit. Grassland Soc.* 3, 1948 (115-140). [Dept. Agric. S. Rhodesia]

Quantitative and qualitative underground development may be affected by nutrients, moisture and texture of the soil, and conditions of temperature and light. Defoliation by cutting or grazing reduces the weight and carbohydrate reserves of the underground parts, which result in reduced vigour and herbage growth. On a large scale this results in changes in the botanical composition of the sward and in a decrease in vegetative cover, paving the way to soil deterioration and erosion.

[169] 633.2.03-1.582
LIVANOV, K. V. **[Increasing the fertility of chestnut soils in the Transvolga with grass rotations.]** *Sovet. Agron.* No. 10, 1948 (39-44). [R.]

The system of grass husbandry, as evolved by Dokuchaev, Kostychev, Timiriajev and Williams, includes grass rotations, soil cultivation, organization of organic and mineral manuring, planting of windbreaks of forest trees, the retention of snow and selection of stable and productive varieties and crops. Grass husbandry is of particular importance on the chestnut soils of the South East where the water regime is important; these soils are poor in organic matter, have a high salt content and are poor structurally. Perennial grasses alter the water and nutrient regime, the organic-matter content and the physical properties of the soil. Perennial grasses increase structural stability in the surface and also in the lower layers. Increasing the stability of the structure of macro-aggregates improves the water and nutrient regimes.

[170] 633.2.03-1.81 : 581.144.2
WEINMANN, H. **Investigations on the underground reserves of South African grasses.** *S. African Sci.* 2, 1948 (12-15). [Dept. Agric., S. Rhodesia]

Although NPK fertilizers increased herbage yields of pastures, they had little effect on the weight and carbohydrate content of the roots. Application of fertilizers did not prevent the exhaustion of root reserves brought about by frequent cutting. Excessive defoliation results in a carbohydrate starvation of the plants, irrespective of the amounts of N and mineral elements available.

[171] 633.2.03-1.84 : 581.192
FRANKENA, H. J. De stikstofbemesting op grasland. Een samenvatting van proefveldresultaten. **[The use of nitrogenous fertilizers on grassland. Results of experiments summarized.]** *Maandbl. Landbouwvoorl. Dienst* 5, 1948 (367-375). Herb. Abs. 18 (239).

The following are discussed: (1) The application of N increases both bulk yield and the percentage of crude protein in the dry matter, and the larger the doses the greater are these increases. (2) Heavy doses of nitrogen can produce (a) in hayfields, the necessity for earlier mowing, at a time when there is a risk of poor weather and (b) in pastures, a change in botanical composition. (3) N applied shortly before mowing produces a higher percentage of crude protein than when it is applied earlier. (4) The favourable effect of N is more marked when the weather in spring is cold. (5) N applied to pastures may produce in the ratio of crude protein to starch equivalents (which should be approximately 1 : 5) undesirable alterations resulting in a waste of protein or even in nutritional disturbances in stock. (6) N is more effective under some types of grassland use than others, and has given the best results under grazing to mid-May, followed by one cut of hay, followed again by grazing. (7) Certain forms of N fertilizer are more effective than others, in which soil type plays a part. (8) The time of application depends on the purpose for which the land is used. (9) Experience shows that a purposeful combination of the use of N fertilizers, farmyard manure and good management can avoid the necessity of applying excessively large quantities of N at any other time. (10) The application of N tends to reduce the proportion of clover in a sward, and the presence of clover tends to reduce the effect of N. This is especially applicable to sown leys with much clover.

[172] 633.2.03-1.862

LUTZ, J. Wiesendüngungsversuch mit verschieden stark verdünnter, kotreicher Gülle im Voralpengebiet der Ostschweiz. [**Manuring trials with different dilutions of rich liquid manure on meadows in the alpine foothills of Eastern Switzerland.**] *St. Galler Bauer* 7/8, 1948, pp. 11. Herb. Abs. 18 (239).

In liquid manure N is present for the most part as volatile compounds of NH_3. The more concentrated the manure and the drier and windier the weather, the more ammonia is lost into the air. When diluted the liquid manure is dispersed more evenly over the ground, penetrates the soil more easily, is less likely to dry out before penetrating, and plants such as clover, sensitive to injury by manure, are undamaged. In a relatively high-rainfall district at an altitude of 950 m., on a soil consisting of sand, humus and clay, a dilution of 1½-3 times produced the highest yields of herbage. The required degree of dilution depends on rainfall and soil.

[173] 633.22-1.531

MCPHERSON, G. M. **Seed production in New Zealand. Cocksfoot.** *N.Z. J. Agric.* 77, 1948 (33-41).

The most successful soils are river silts, free-working loams or peaty soils containing an admixture of clay. 1 cwt./acre of reverted super. or serpentine super. should be drilled with the seed; in the wetter districts straight super. can be used.

[174] 633.288-1.5

LYNCH, P. B.; OSBORN, W. L. **Pampas grass in New Zealand.** *N.Z. J. Agric.* 77, 1948 (4-10).

A survey of pampas grass (*Cortaderia selloana*) plantations throughout New Zealand where it is grown as stock fodder. Its use for this purpose appears to be confined mainly to New Zealand. No accurate measurements of the effect of fertilizers on pampas grass on various soil types are available and no responses from fertilizers have been observed.

633.3 LEGUMES

(*See also* Abs. Nos. 336, 359)

[175] 633.3 : 546.27

ROGERS, H. J. **Response and tolerance of various legumes to borax and critical levels of boron in soils and plants.** *Better Crops* 32, 1948 (9-16, 40-45). [Auburn, Ala.]

No increases in plant growth were obtained where untreated soil contained more than 0.15 p.p.m. of hot-water-soluble B. In nearly every test untreated lucerne, crimson-clover and bur-clover plants contained less than 6 p.p.m. of B when grown on fields where response to B was obtained. If these legumes contained less than 10 p.p.m. of B or the soil contained less than 0.15 p.p.m. of hot-water-soluble B, there was response to additions of B on the coarse-textured red and yellow podzolic soils. These critical levels probably do not apply to fine-textured soils of the same region or to soils of other regions that have high B-fixing capacities.

It is concluded that lucerne, which has been rated as having a high B requirement, actually needs very small amounts when grown on soils with a low Ca supply and low base-exchange capacity.

A single application of 20 lb./acre of borax produced maximum yields of lucerne for three years on sandy soils low in B. Stands of Austrian winter peas, crimson clover, red clover and white clover were severely injured on sandy soils by application of 15 lb./acre of borax at time of seeding. Soybeans and sericea also showed low tolerance of B. By delaying the application of B until the seedlings were established and good soil-moisture conditions obtained, injury to the stands of susceptible legumes was diminished. For bur clover on soils which were very low in B, B had to be applied previous to or at time of seeding.

[176] 633.3-1.811.1-1.84

THORNTON, G. D. **The effect of nitrogen fertilization on the nitrogen nutrition of legumes.** *Iowa St. Coll. J. Sci.* 22, 1947 (81-86).

$Ca(NO_3)_2$, $NaNO_3$, $(NH_4)_2SO_4$, KNO_3 and N^{15}-enriched nitrogen were applied to soybeans, lespedeza, white, red and sweet clovers and groundnuts. Nodulated soybeans did not make maximum growth when they depended solely on fixation for N

supply. The amount of N fixed by soybeans was inversely related to the amount of available combined N in the soil. N applied at planting greatly depressed nodulation. When $Ca(NO_3)_2$ enriched with N^{15} was applied to lespedeza, the added N had no appreciable effect on fixation during the first 9 weeks of growth, but after that time N treatment depressed fixation. N fertilizers increased the N content and yields of red and sweet clovers, but diminished or increased fixation according to the type and amount of fertilizer used. $Ca(NO_3)_2$ caused early maturity of groundnuts, but excessive amounts of combined N delayed maturity. N absorption took place through the gynophores, the proportion absorbed being related to the amount of available N in the rooting zone. When this amount is ample, either in a combined form or from nodulation, only 29% of the N applied is absorbed, but when the level is near N starvation, 98% is absorbed.

[177] 633.3-1.85
PARR, C. H.; SEN, S. **Phosphate manuring of legumes in relation to green manuring. IV.** *Indian Farm.* 9, 1948 (227-238). [Indian Agric. Inst. New Delhi]

Experiments during the last 5 years have shown that for soils low in P green manuring is effective only when adequate amounts of P are added. P fertilizers improve the yields of legume crops and increase the P, Ca and protein contents of the herbage. In the presence of ample supplies of available P the legumes are able to make luxuriant growth and build up large quantities of N which are left behind in the easily decomposable root residues.

[178] 633.31-1.5
WOODHOUSE, W. W., JR. **Growing alfalfa in North Carolina.** *Better Crops* 32, No. 7, 1948 (6-8, 41). [Dept. Agron., Univ. N.C., Raleigh]

Discing down a cover crop such as lespedeza helps in establishing lucerne by reducing erosion and preventing baking of clay soils. Part of the cover should be left on the surface as a mulch. Lucerne is responsive to heavy applications of P made prior to seeding and the effect carries over several years. Excessive K applications result in excessive K uptake without an increase in yield. B is usually necessary on North Carolina soils.

[179] 633.31-1.828 : 546.27
NAFTEL, J. H.; WILSON, C. M. **Studies in relation to alfalfa fertilization on some Alabama soils.** *Ala. Agric. Expt. Sta. Rept. 1945-46*, 1948 (10).

Analyses of soil samples taken at different depths from plots receiving B and plots receiving no B showed that B moves downwards in the soil profile at a fairly rapid rate. B-deficient alfalfa showed a Ca/B ratio of at least 600 : 1. As long as this ratio was not greater than 500 : 1 no deficiency symptoms were evident in alfalfa.

[180] 633.321 : 633.1-1.582
NEW SOUTH WALES AGRICULTURAL GAZETTE. **Value of red clover in maize and oat rotations—yields improved and fertility maintained—results at New England experiment farm.** *N.S.W. Agric. Gaz.* 59, 1948 (339-343).

The popular farming practice is to grow maize and oats, both soil-exhausting crops more or less continuously. Experiments have proved the value of a rotation which includes red clover and have shown that the correct sequence when oats is the main crop is : maize, spring oats, red clover, autumn oats.

[181] 633.321-1.5
HEUSINKVELD, D. **Red clover for Illinois.** *Ill. Coll. Agric. Circ.* 627, 1948, pp. 23. [Bur. Pl. Indust., U.S.D.A.]

Red clover thrives best on well drained, moderately heavy loams, rich in organic matter and of pH just below neutral. Finely ground limestone is generally used to correct soil acidity. An ample supply of P in the soil is necessary for establishing the crop. Rotations of (1) red clover, maize, oats or wheat, and of (2) maize, soybeans, oats or wheat, and clover maintain organic matter and soil fertility. Where winter wheat is the major grain crop, the rotation wheat, wheat, clover is suggested.

[182] 633.329-1.85
PARR, C. H.; BOSE, R. D. **Phosphate manuring of legumes for increased food and fodder. III.** *Indian Farm.* 8, 1947 (267-275). [Indian Agric. Res. Inst. and Indian Cent. Sugarcane Cttee., New Delhi]

High dosages of super. (132, 198 and 264 lb. of P_2O_5) increased the yields of berseem and built up residual value for the next crops.

Experiments were carried out to study the effect of smaller amounts of P as super. or farmyard manure. The application of 64 lb. of P_2O_5 or about 2 maunds of super. per acre applied in 3 consecutive years was inadequate for berseem, showing that a high initial P-dressing is necessary. Wheat following 3 manured crops of berseem and 3 unmanured crops of cowpeas showed a response to 64 lb. of P_2O_5. Berseem showed a good response to ammonium phosphate, and in its early stages made good use of N when in association with available P, but not of N applied alone in the form of $(NH_4)_2SO_4$.

[183] 633.34-1.5
DIMMOCK, F. **Soybeans.** *Canad. Dept. Agric. Pub.* 808, *Farm. Bull.* 149, 1948, pp. 19.

A revision of Farmers' Bulletin 80. The soil requirements of soybeans are similar to those of corn and other grain crops. A soil too acid for clover will often produce a good crop of soybeans, although under such conditions liming is usually beneficial. For soil improvement the entire crop should be ploughed under not later than the flowering stage. In Canada soybeans are not too well adapted as a hay crop, because of difficulties of curing satisfactorily. Soil preparation is the same as for maize. Autumn ploughing is preferable, followed by thorough working early in the spring.

[184] 633 34-1.85 : 581.192
PETERSON, W. J.; SHERWOOD, F. W.; MATRONE, G., ET AL. **The influence of phosphate fertilization on the carotene and riboflavin content of the soybean plant.** *Amer. Fert.* 109, No. 3, 1948 (24). [U.S. Nutrit. Lab., Ithaca, N.Y.]

Although the mean weight of individual plants receiving P was 2.5 times that of plants without P, the proportions of leaves, stems and pods were not influenced by fertilizers. P fertilizers increased the carotene content of the leaves from 186.4 to 222.6 mg./g. on an air-dry basis and riboflavin from 22.03 to 25.69 mg./g.

[185] 633.34-2.191 : 546.711
STECKEL, J. E. **Manganese-deficient soybeans in Indiana.** *Soybean Dig.* 8, No. 8, 1948 (14-15). R.A.M. 27 (507).

Where soybeans are planted in fields which have already shown Mn deficiency, 25 lb./acre of $MnSO_4$ should be mixed with the usual fertilizer and applied to the side of the seed at planting. When Mn-deficiency symptoms appear after emergence the plants should be sprayed with 10 lb./acre of $MnSO_4$ in 75 gallons of water.

[186] 633.34-2.4-1.582
ALLINGTON, W. B.; CHAMBERLAIN, D. W. **Brown stem rot of soybean.** *Phytopath.* 38, 1948 (793-802). [U.S. Reg. Soybean Lab. and Ill. Agric. Expt. Sta., Urbana]

Cephalosporium gregatum n.sp. is probably indigenous in midwest U.S.A., is soil borne and can be controlled by rotations of 3 successive annual crops other than soybeans between soybean plantings. Air temperatures are critical, temperatures of below 21°C. being essential for the rapid spread of the disease up the stem ; soil temperatures have no effect. Infection from the soil in the root and basal stem parts of the plant spreads slowly under high summer temperatures, but spreads rapidly up the stem in cool autumn days.

[187] 633.364-1.811.9 : 581.192
SHELDON, V. L.; BLUE, W. G.; ALBRECHT, W. A. **Diversity of amino acids in legumes according to the soil fertility.** *Science* 108, 1948 (426-427). [Univ. Missouri]

The protein quality, in terms of the different amino acids, of lespedeza was assayed using microbiological techniques, and found to vary with the soil type on which the crop was grown. In order to determine what fertility elements might be the cause of these diversities lucerne was grown on a single soil treated with Mn, B and a mixture of these elements with Co, Cu and Zn as supplements to Ca, P and K fertilizers. The quality of the lucerne protein was modified by these treatments, especially with respect to the methione content, and the tabulated results substantiate the hypothesis that Mn and B function in the conversion of the carbohydrate into protein.

As the need for protein is greater than that for carbohydrate it is suggested that quality according to the fertility of the soil be used as a measure of agricultural production, rather than bulk.

633.491 POTATOES

[188] 633.491-1.582

LEITCH, C. C. **Potatoes and wheat the major cash crops.** *N.Z. J. Agric.* 77, 1948 (237-240). [Ass. Fds. Super., Christchurch]

Farming practices on a typical property in South Canterbury, with potatoes as one of the major cash crops, are discussed. 3- to 4-year-old grass is ploughed up and sown to potatoes, wheat and oats in rotation, followed by grass for 3-4 years. All crops are sown with fertilizer. 1 ton/acre of lime is topdressed on all newly sown pasture.

[189] 633.491-1.67 : 581.192

THIESSEN, E. J. **The culinary qualities and nutritive values of potatoes grown upon dry and irrigated land.** *Wyo. Agric. Expt. Sta. Bull.* 280, 1947, pp. 31.

[190] 633.491-1.81

BUSHNELL, J. **Fertilizer and cultural experiments with potatoes reported during 1944-1946.** *Amer. Pot. J.* 25, 1948 (329-333). [Ohio Agric. Expt. Sta., Wooster]

71 references to experiments are given.

[191] 633.491-1.811 : 581.192

NYLUND, R. E. **A preliminary study of the use of rapid chemical tests as aids in diagnosing nutrient deficiencies in the Irish potato.** *Amer. Potato J.* 25, 1948 (216-224). [Minn. Agric. Expt. Sta., St. Paul]

Applications of N fertilizer at 80 or 160 lb./acre doubled both the N content of potato-leaf petioles and the yield of tubers. The concentrations of soluble P and K were inversely correlated with soluble-N content of petioles. Applications of P fertilizer had no effect on yield of tubers nor on the soluble-N content of petioles. With high N supply, application of P gave significantly higher P content and slightly lower soluble-K content of petioles. Applications of K fertilizer did not affect tuber yields or the soluble-N content of petioles. With high N supply, K fertilizer gave significantly higher soluble-K content and had no effect on soluble-P content of petioles. Maximum yields were obtained when the soluble-N content of petioles, at the time of the first flower buds, was 600-700 p.p.m., soluble-P content was 300-400 p.p.m. and soluble-K content 4200-6200 p.p.m.

[192] 633.491-1.811.1

TERMAN, G. L.; HAWKINS, A.; JUNKINS, S. C., ET AL. **Nitrogen rate experiments.** *Amer. Fert.* 109, No. 7, 1948 (26).

Potato yields following clover were the same after applications of N fertilizer at 90, 120 and 150 lb./acre. Following potatoes for 2 or 3 years, yields were significantly greater from applications of 120 and 150 lb. than from 90 lb.

[193] 633.491-1.811.9 : 546.47

TERMAN, G. L.; HAWKINS, A. **Response of potatoes to zinc.** *Amer. Fert.* 109, No. 7, 1948 (26).

In two of 4 experiments with fertilizer containing 20 lb./acre of $ZnSO_4$, yields of potatoes were not increased and in the other 2, yields were increased by 12 bushels/acre. On one plot cropped every year to potatoes, Zn increased yields by 32 bushels; in another where potatoes were grown in alternate years with clover, yield was increased 11 bushels; on a plot rotated in alternate years with millet, yield was increased 2 bushels. The results indicate that Zn may be more deficient in some soils cropped every year or frequently to potatoes than where rotation is practised and adequate amounts of organic matter are returned to the soil. Yield responses to Zn may explain some increased yields obtained with dithane and other fungicides containing $ZnSO_4$.

[194] 633.491-1.83 : 581.192

TERMAN, G. L.; HAWKINS, A.; JUNKINS, S. C. **Maine potato fertilizer tests. Potash source experiments.** *Amer. Fert.* 109, No. 7, 1948 (11).

K_2SO_4 produced a higher content of starch than did KCl. Plants fertilized with KCl had a higher Cl content and lower content of N, Mg and dry matter. There is an inverse relationship between Cl content in the plant and starch content in the tubers.

[195] 633.491-1.85-1.816.3

HAWKINS, A.; TERMAN, G. L.; JUNKINS, J. C. **Phosphorus placement tests.** *Amer. Fert.* 109, 1948, No. 7 (11, 26).

In placement tests with potatoes, about ¼ inch of soil was placed on top of the band of P fertilizer before the seed was planted, or on the planted seed before fertilizer was applied, because freshly cut seed is injured by direct contact with super. In soils with

low to medium readily soluble P, yields of potatoes were lower when 80 lb./acre of P_2O_5 were applied with the seed than when applied in side bands. On a soil high in P the 2 methods produced the same yield. Application of 80 lb. with the seed together with 80 lb. in side bands gave slight but not significant increase in yield over application of 160 lb. in side bands.

[196] 633.492-2.112-1.84
MINGES, P. A. **The nitrogen factor in sweet potato production in Iowa.** *Iowa St. Coll. J. Sci.* 22, 1947 (61-63).

The beneficial effect of $NaNO_3$, $(NH_4)_2SO_4$, Uramon, calcium cyanamide and $Ca(NO_3)_2$ applied to a coarse sand of pH 4.6-5.5 was decreased in a dry year. Sweet potatoes are sensitive to the supply of nitrates in the soil and applications of N in drought years were sometimes detrimental; in years of heavy spring rains 25 lb./acre applied 3-4 weeks after planting may be followed by a second application with abnormally heavy summer rainfall. Barnyard manures were not as satisfactory as commercial fertilizers. $NaNO_3$ and $(NH_4)_2SO_4$ were satisfactory for either pre-planting or side-dressing applications, but the N in these forms was subject to leaching. Calcium cyanamide was satisfactory in wet years when applied 2 weeks before planting, but its toxic properties make it unsuitable for side dressing; it is injurious in dry years.

633.5 FIBRE PLANTS

(*See also* Abs. No. 313)

[197] 633.51-1.51
GADKARI, P. D.; JOSHI, V. K. **Studies in the agronomy of Gaorani cottons. I. Preparatory tillage and interseasonal cultivations.** *Indian J. Agric. Sci.* 16, 1946 (504-511).

Present methods of preparatory tillage with *desi* implements need no improvement. Weeding is usually done with implements which remove the weeds and also mulch the soil. The common *khurpi* is more efficient for this purpose than either the blade hoe or the Indore ridger, because it causes the least disturbance to the roots. One weeding should be enough, additional weeding being beneficial only in years of abnormally late rains.

[198] 633.51-1.582 : 633.35
ANTHONY, J. L. **Production of hairy vetch and its utilization for cotton production.** *Miss. Agric. Expt. Sta. Bull.* 436, 1946, pp. 18.

On a fairly productive brown silt loam, annual applications of P and lime were required to increase cotton production. Fertilized cotton following unfertilized vetch, turned under, yielded slightly more seed cotton than did unfertilized cotton following fertilized vetch turned under. Removal of fertilized vetch for hay depressed cotton yields 115 lb./acre and removal of unfertilized vetch depressed yields 193 lb. Yields of cotton fertilized with $NaNO_3$ following fertilized vetch, removed for hay, were higher than those from the same amount of unfertilized vetch turned under. Using 500 lb. of 0-8-4 fertilizer + 500 lb. of lime, the 7-year average yield was nearly 7000 lb./acre of green vetch. Unfertilized cotton following this vetch turned under yielded 1221 lb./acre as compared with 1068 lb. for unfertilized cotton following turned-under vetch fertilized with 500 lb. of 0-8-4 and no lime. With vetch turned under, a split application of super. gave a bigger yield than one application of 500 lb./acre.

[199] 633.51-2.2
MITCHELL, B. L. **Tests for eelworm resistance in various cottons.** *S. Rhod. Cott. Res. and Indust. Bd. Rept. 1946-47*, 1948. Emp. Cott. Grow. Rev. 25 (230).

8 strains of cotton were all lightly infested with eelworm in a soil known to be heavily infested. The galls formed were not of the large permanent type that occurs in tobacco; the affected cotton rootlet dies and is shed by the plant before the nematode has time to reproduce. It is possible that this intolerance of the cotton rootlet to eelworm galling may be the key to the reason why the infestation of tobacco following cotton is much reduced.

[200] 633.51-2.954
HALLIDAY, D. J. **Selective weed control by chemical means.** *Emp. Cott. Grow. Rev.* 25, 1948 (173-179). [I.C.I., Jealott's Hill, Bracknell, Berks.]

A historical outline is given of the use of weedkillers, and the herbicidal properties of H_2SO_4, $FeSO_4$, $(NH_4)_2SO_4$, Cu compounds, DNOC, MCPA and DCPA, cyanamide,

kerosene oil and K fertilizers are described. Cotton is highly susceptible to contact and selective weedkillers. In U.S. drifting sprays have damaged cotton up to 700 feet away from the point of application. In the Sudan where cotton is grown in an 8-year rotation there are indications that MCPA may safely be used for weed control during the 2 years of fallow.

[201] 633.52-2.191 : 546.47
SMITH, W. P. C. **Zinc deficiency of flax.** *J. Agric. W. Aust.* 25, 1948 (136-142).

Zn-deficiency symptoms include dieback of the tip of the young plant, bronze-leaf spotting and leaf rosetting, followed in most cases by regrowth of the stunted main stem or production of lateral shoots from the base. Fertilizer incorporating $ZnSO_4$ applied at planting time yielded healthy plants and improved the yield and quality of fibre.

The severity of the symptoms seemed to be in direct proportion to the amount of waterlogging. The types of soil where dieback was most severe were grey to grey-brown gritty or gravelly loamy sands to sandy loams with clay at a depth of 1-2 feet.

On the deeper reddish loams flax was almost free from dieback. Super. also affected the incidence of dieback. A drill strip of flax sown for a distance of a few chains without super. was free from dieback, whereas the plants which had received the usual dressing of super. were severely affected by dieback.

[202] 633.529.5-1.81
GILLERN, C. VON. Düngungsversuch für eine Ertragssteigerung und Qualitätsverbesserung der Weberkarde. [**A fertilizer experiment for improved yield and quality of fuller's teasel.**] *Landw. Jahrb.* 93, 1943 (319-330). [G.e f.i.sp.]

About 40 million heads of the teasel *Dipsacus fullonum* L. are used annually in Germany for carding in textile factories. A slightly alkaline sandy clay was the most suitable soil and the best yields were achieved with town refuse, which was applied at about 16 tons/ha. The best fertilizer treatment was 320 kg./ha. of 40% K salts + 480 kg./ha. of ammoniated nitrate of lime (kalkammonsalpeter). Small dressings of CaO improved quality, but heavy dressings were harmful. P, as basic slag, depressed the yield.

633.6 SUGAR CROPS

[203] 633.61-1.581
ARCENEAUX, G.; MAYEUX, L. C. **Agronomic progress with sugar cane in Louisiana.** *Sug. J.* 10, No. 7, 1947 (9-10). Sugar 42, No. 10 (52).

Among control measures that give reasonable results with Johnson grass, a major weed pest in Louisiana, is fallow ploughing in place of the usual soybean crop for green manure between cycles of sugar cane. Fallow ploughing is much more beneficial than growing soybeans for green manure.

[204] 633.61-1.81
FIELDING, W. L. **Science aids progress in sugar production. Introduction of new cane varieties has increased industry's average yield by fifty per cent. Research work at Mount Edgecombe.** *Farm. Week. S. Africa* 76, Oct. 27, 1948 (52-57). [S. Afric. Sug. Assoc., Mount Edgecombe, Natal]

Sugar cane responded to a dressing of super. on many soil types of the area. A recommended dressing is 600 to 800 lb./acre of super. applied in the furrow at planting. Phosphate is primarily important in stimulating root production; the basic dressing has the effect of starting the new cane stool off with a vigorous feeding system. N fertilizers applied as a top dressing in the form of $(NH_4)_2SO_4$ or $NaNO_3$ at the rate of 400 lb./acre increased yields of cane particularly on lighter soils; as a basic dressing at planting N does not increase yields. P fertilizers have the opposite effect.

Methods of dealing with the trash left on a field where an old ratoon crop has been cut are discussed. If it is ploughed, a long fallow under a velvet bean crop is suggested as a method of maintaining the N content of the soil.

[205] 633.61-1.81
SHERRARD, C. D. **A summary of results of manurial trials in the sugar belt.** *S. Afric. Sug. J.* 32, 1948 (477-487). [Expt. Sta. Mount Edgecombe]

The following points are made regarding the design of field experiments. Reasonable soil uniformity is essential on the site of an experiment, a large number of replications must be allowed for, repetition on different soil types is desirable, the split-plot design

including trash managements and NPK treatments with greater differences in weights of fertilizer per acre are proving most suitable. Super. is the most economical form of P manure. A top-dressing of P to ratoons which have received basic dressings of P in the plant-cane stage gives no further response. The application of P other than in the furrow at planting time is of doubtful value. Greatest response can be expected on the more sandy soil types, and as the soil type becomes heavier, the response to P becomes less. The sandy loams and clay loams of alluvial flats do not respond to application of P. Virgin land and land not previously under cane give big responses to P. Dressings of 500-800 lb./acre of super. in the furrows at planting time have given the best results.

Top-dressings of N fertilizers to plant cane and ratoons in seasons of reasonable rainfall will give economic responses provided the price of N is not prohibitive. Dressings of 300-400 lb./acre of $(NH_4)_2SO_4$ and $NaNO_3$ are applied to plant canes 3-6 weeks after planting, and to ratoons approximately the same time after cutting. Cases where responses have not been recorded are on plant canes in fields previously under a leguminous green-manure crop. Lack of response has also been noted in high-altitude areas where soil analysis shows high N content.

Inorganic forms of N used in the furrow at planting have occasionally depressed yields of cane. It is only as a top-dressing to plant or ratoon cane that responses with N can be obtained. Greater responses can be obtained on sandy soils than on the loams or clay loams. It is advisable to leave K out of the fertilizer scheme for cane until further investigations have been carried out as the position with regard to the use of this fertilizer is said to be obscure.

[206] 633.61-2.191

NAVARRETE, F. S. Estudio sobre la "clorosis" de la caña de azucar en El Mante, Tam. [**Studies on the chlorosis of sugar cane at El Mante (Province of Tampico, Mexico).**] *Fitofilo, Mexico* 4, No. 6, 1945 (323-335). [Sp.] Rev. Int. Indagr. 8 (443).

The symptoms and causes, including the influence of cold and of soil deficiencies in K Fe, S, N, P, B and moisture are described.

[207] 633.61-2.7

PICKLES, A. **Estimation of the number of froghopper eggs in cane-field soil.** *Proc. Agric. Soc. Trin. Tob.* 46, 1946 (75, 77, 79, 81, 83).

The sugar-cane froghopper passes the dry season in the egg stage in the soil close to the cane stalks. Tillage before the fields are replanted makes it almost impossible for froghoppers to survive in sufficient numbers to cause serious injury.

[208] 633.61-2.954 : 577.17

HANCE, F. E. **Recent developments in weed control.** *Science* 108, 1948 (278 279). [Hawaii Sug. Plant. Assoc., Honolulu]

In heavy adobe soils of pH 6.0-7.0 as much as 25 lb./acre of 2,4-D has no observable detrimental effect on cane. In lighter soils of pH 6.5-7.5 an application of 2½ lb./acre penetrates 3 inches or more into the soil without fixation or decomposition and may prevent the germination of recently-planted cane or may distort root development and growth of cane shoots. An application of 2 lb./acre may be supplemented with about 10 lb./acre of H.S.P.A. activator (pentachlorophenol or Na pentachlorophenate) which does not injure the seed piece or adversely affect growth.

The downward movement in soil of soluble 2,4-D may be discouraged by applying it in oil solution, the formula for which is 66 lb. of aromatic petroleum oil, 10 lb. of oil-soluble activator, 2½ lb. of isopropyl ester of 2,4-D and 2 lb. of oil-soluble emulsifying agent; the whole makes about 10 gallons. The activator is dissolved in the oil and the ester and the emulsifying agent are added. The 10 gallons of 2,4-DAC are added to 90 gallons of water containing 0.5% by weight of a conditioner consisting of an alkyl aryl sulphonate; the emulsion remains stable for hours. The 100 gallons may be applied to 1 acre of bare soil by ordinary spraying equipment.

[209] 633.63-1.3

BEVAN, A. P. **Beet harvester design.** *Farm Mech.* 2, 1948 (223-225).

[210] 633.63-1.3

WALKER, H. B. **A resume of sixteen years of research in sugar-beet mechanization.** *Agric. Engng.* 29, 1948 (425-430). [Univ. Calif.]

An outline is given of the development since 1931 of machinery for thinning sugar beets, planting equipment, harvesting machines, sigmenting of seed and seed processing.

[211] 633.63-1.427.3
HALAIS, P. **Foliar diagnosis: a comparative index of the mode of nutrition of sugar cane.** *Rev. Agric. Maurice* 27, 1948 (122-125). [E.]

Full text of a paper which appeared in "Sugar" March 1948 "with a number of unwarrantable omissions". It is claimed that when the correct method of leaf sampling has been determined for a given set of conditions foliar diagnosis will give a reliable indication of the fertilizer requirements of sugar cane.

[212] 633.63-1.51
DECOUX, L. La préparation superficielle du sol et le semis précoce de la betterave sucrière. **[Superficial preparation of the soil and early sowing of sugar beet.]** *C.R. Acad. Agric.* 34, 1948 (867-869). [F.]

It is suggested that the usual method of deep cultivation should be replaced by surface cultivation. Most of the work such as spreading farmyard manure and the application of fertilizers should be done in the autumn. In the spring it should only be necessary to top-dress with a N fertilizer and cultivate with some form of disc implement to a depth of not more than 5 cm.; this should make it possible to sow the beet seed the same day or the next day at the latest.

[213] 633.63-1.582-1.81
COOK, R. L.; MILLAR, C. E.; ROBERTSON, L. S. **Sugar beets in seven Michigan systems of crop rotation.** *Proc. Amer. Soc. Sug. Beet Tech. 1946*, 1947 (73-87). Biol. Abs. 22 (1191). [Mich. St. Coll., E. Lansing]

Sugar beets yielded significantly more in all rotations with fertilizer application of 1000 lb./acre than with 400 lb. for the rotation. Marked increases in yield were also recorded for barley, oats and wheat as a result of the heavier fertilizer application.

[214] 633.63-1.582-1.81
NUCKOLS, S. B.; HARRIS, L. **Effect of crop rotation and manure on the yield and quality of sugar beets, United States Scotts Bluff (Nebr.) Field Station, 1930-41.** *U.S.D.A. Circ.* 779, 1948, pp. 20. [Bur. Pl. Indust.]

Inclusion of legumes in the rotation and the application of manures increased yields of sugar beet; the sucrose percentage was slightly depressed but the weight of beets was increased. Ploughing-under of green lucerne in late spring increased root yield, but the increase was greater when sweet clover in the rotation was pastured with sheep. 6-7 year rotations including lucerne and the application of manure are recommended.

[215] 633.63-1.81
SIMON, M. La fumure minérale de la betterave sucrière, dans les conditions belges de production. **[Mineral fertilizer for sugar beet under Belgian conditions.]** *Publ. Inst. Belge Amélior. Better.* 16, 1948 (249-258). [F.fl.e.]

The amount of N which should be used for sugar beet varies between 90 and 174 kg. of N/ha.; that of P fertilizers should not exceed 75 kg. of P_2O_5/ha. on a fertile soil. K fertilizers should be applied in the form of K salts with a high Na content. Belgian soils appear to contain a sufficiency of minor elements for sugar beet, with the exception of B and Mn. B in particular must be supplied in order to prevent heart rot.

[216] 633.63-1.84 : 581.192
JOSEFSSON, A. Kombinerade sort- och kvävegödslingsförsök med rotfrukter, utförda vid Sveriges Utsädesförening under åren 1927-1945. **[Combined variety and nitrogen-dressing trials with root crops, performed at the Swedish Seed Association in the years 1927-1945.]** *Sverig. Utsädesfören. Tidskr.* 58, 1948 (91-131). [Sw.e.]

Applications of Chilean nitrate and of $NaNO_3$ at 450 kg./ha. gave good results with mangolds and sugar beet. Dry-matter content decreased 0.12-0.14% for every 100 kg./ha. of nitrate applied and sugar content in sugar beets decreased 0.14%. Content of crude protein increased. Dressings of N increased the tendency to bolt.

[217] 633.63-1.874
DÉCOUX, L. Mécanisation et humus. [**Mechanization and humus.**] *Indust. Agric.* 65, 1948 (195-202). [F.] [Inst. Belge Amélior. Better., Tirlemont]

The gradual increase in mechanization of crop production has led to a decrease in livestock on farms with a consequent decrease in farmyard manure. As sugar beet needs humus it is suggested that farmyard manure should be replaced by the use of green manures, leguminous plants being introduced in the rotation.

[218] 633.689-1.5
MEENAKSHISUNDARAM, K. **A short note on the cultivation of elephant yam (*Amorphophallus campanulatus*).** *Madras Agric. J.* 31, 1943 (104-107). Biol. Abs. 22 (1202).

Methods of cultivation are given. This crop has an exhaustive effect on the soil.

633.71 TOBACCO

(*See also* Abs. Nos. 199, 314)

[219] 633.71-1.4 : 581.192
NAUDÉ, C. P. **The production of nicotine sulphate.** *S. Africa Dept. Agric. Sci. Bull.* 278, 1947, pp. 128.

The influence of factors such as fertilizers and climate on the nicotine content of tobacco is reviewed. The nicotine content for the same varieties varied according to the soil type.

[220] 633.71-1.531
McEVOY, E. T. **Construction and management of tobacco seed-beds.** *Canada Dept. Agric. Pub.* 806, 1948, pp. 25. [Tobacco Div. Cent. Expt. Farm, Ottawa]

Instructions for growers on the methods of producing good tobacco seedlings. Type, site and preparation of bed are discussed. Muck is recommended in Ottawa for use for the top layer of the beds, while in Quebec a muck-manure compost is satisfactory for the top layer. For seed-bed sterilization, steam, formaldehyde or chloropicrin are discussed. A light application of a complete fertilizer should be applied to the bed.

[221] 633.71-1.531-2.954.6
THOMPSON, J. W. **Cyanamide as a means of control of weeds in seed-beds.** *Trelawney Tobacco Res. Sta. Rept. 1947*, 1948 (42-43).

On seed beds which had been burnt the previous season, cyanamide was worked into the top 4 inches of damp soil at the rate of $\frac{3}{4}$ lb./sq.yd. and $\frac{1}{4}$ lb./sq.yd. was applied to the surface. Weed control was excellent, and there was no difference between the application of cyanamide with initial watering and watering at intervals after application. Tobacco seed germinated satisfactorily, but did not grow well because the treated beds were too alkaline after the previous year's burning. Cyanamide at 1 lb./sq.yd. raised alkalinity to a toxic level. Application of sulphur at 10 gm./sq.yd. neutralized the soil in 2 weeks. The rate of application of cyanamide was equivalent to 1000 lb./acre of N, and of this $\frac{3}{4}$ had been lost after $3\frac{1}{2}$ months. The amount of ammonia in the soil was raised from 12 to 70 lb./acre.

[222] 633.71-1.81 : 581.192
HOLDEN, M.; TRACEY, M. V. **The effect of fertilizers on the levels of nitrogen, phosphorus, protease and pectase in healthy tobacco leaves.** *Biochem. J.* 43, 1948 (147-151). [Rothamsted]

Tobacco was grown in pots containing a N- and P-deficient mixture of soil, sand and peat to which N, P and K were added singly and in combination. The N and P additions resulted in increases in total-N and -P contents and in wet weight. P increased the proportion of fibre and protease, but lowered pectase levels which were raised by N additions. Protease contents were decreased by N. No significant effects of K were observed.

[223] 633.71-1.811-2.8 : 581.192
HOLDEN, M.; TRACEY, M. V. **The effect of infection with tobacco-mosaic virus on the levels of nitrogen, phosphorus, protease and pectase in tobacco leaves and on their response to fertilizers.** *Biochem. J.* 43, 1948 (151-156). [Rothamsted]

Tobacco plants, some of which were infected with mosaic virus, were treated with N, P and K singly and in combination. Local multiplication of the virus for a 10-day period resulted in no significant change in response of the plants to fertilizers, but continued multiplication of the virus increased the positive effect of P and negative effect of N on the protease units/gm. of protein N of the sap and also the positive effect of P on the total N of the leaves.

[224] 633.71-1.816.3
RETIEF, D. F. **Methods of fertilizer application for tobacco.** *Farm. S. Africa* 23, 1948 (453-460, 494). [Rustenburg Agric. Res. Sta.]

Broadcasting, row application and planting-hill methods of applying kraal manure and artificial fertilizers for snuff-tobacco production were compared. Kraal manure may be either broadcast or applied in rows. Artificial fertilizers should definitely not be broadcast. The divided-application and the planting-hill methods are not recommended. The band method gave the best percentage of germination and the highest yield of maize.

[225] 633.71-1.816.32
PERUCCI, E. La concimazione localizzata del tabacco nella odierna situazione dei concimi. [**Placement of fertilizers for tobacco in the present fertilizer situation.**] *Tabacco* 51, No. 573, 1947 (16-21). Rev. Int. Indagr. 8 (445). [I.]

Placement of fertilizer in furrows between the plants was advantageous.

[226] 633.71-1.86-1.816.3
STREET, O. E.; JENSEN, C. O. **A soil management program for Penn tobacco farmers.** *Better Crops* 32, No. 7, 1948 (21-24, 41). [Penn. St. Coll.]

Manures from various sources were compared for their value to cigar-filler tobacco. The best yield was obtained with a partly rotted mixture of horse and stockyard manure. Sewage sludge came second. Poultry manure should only be used at a very low rate owing to its high N content. Sheep manure at 10 tons/acre was good.

Under Pennsylvania conditions it is necessary to maintain a high level of nutrients and organic matter. The use of a sod crop in the four-year rotation of tobacco, wheat, hay and maize with proper mineral manuring of all the crops is recommended. Improved methods of fertilizer placement and supplemental applications of potash have proved effective. The grading was better with band treatment and with bands + 380 lb. of K_2O supplement than with broadcast applications.

[227] 633.71-1.875
THOMPSON, J. W. **The chemical effects of compost.** *Trelawney Tobacco Res. Sta. Rept. 1947*, 1948 (43-47).

Increase in yield of tobacco after application of compost was primarily due to an increased supply of P that was associated with the effect of compost on the pH of the soil. Kraal compost with a pH of 8.3 and farm compost with a pH of 8.6 had the greatest effect on phosphate availability and on soil acidity. Composts with the least effect had a pH of 7.2 and 7.3. The increased growth produced by the better P supply diluted the N in the plant and this has resulted in an increase in sugar content which is associated with increase in quality. Compost increased the K supply.

The degree of breakdown of the compost is not very important. The C/N ratio decreases as the compost matures and the nearer the compost is to maturity the more available is the N content unless N losses take place by leaching or excessive alkalinity.

[228] 633.71-2.19 : 546.72
JONES, L. H.; TIO, M. A. **Unavailability of iron as a cause of frenching of tobacco.** *Plant Physiol.* 23, 1948 (576-594). [Agric. Expt. Sta., Univ. Mass., Amherst]

A high soil temperature of 35°C. encouraged microbiological activity in the soil; this disturbed the normal soluble-Fe content of the soil and resulted in Fe deficiency in the tobacco plant. The results of experiments do not support a soil-toxin theory nor do they afford evidence that any deficiency of a mineral element exists in the soil.

[229] 633.71-2.19-1.43
JONES, L. H. **Soil temperature as a factor in the frenching of tobacco (*Nicotiana tabacum* L.).** *Plant Physiol.* 23, 1948 (560-575). [Agric. Expt. Sta., Univ. Mass., Amherst]

Tobacco plants were grown in a compost soil in a constant-soil-temperature apparatus. Frenching was induced at the high soil temperature of 35°C., and was absent at the soil temperature of 21°C. or lower, but it is not claimed that temperature is a primary factor. Air-drying of a soil destroyed its ability to produce frenching symptoms. No symptoms of frenching developed when plants were grown in culture solution at a temperature of 35°C. The role of temperature in the soil may be that of regulating physico-chemical reactions or influencing some biological activity of soil flora.

[230] 633.71-2.595.16 : 633.3
WILD, H. **A suggestion for the control of tobacco witchweed (*Striga gesnerioides* (Willd.) Vatke) by leguminous trap-crops.** *Rhod. Agric. J.* 45, 1948 (208-215).

Known indigenous hosts of *Striga gesnerioides* are listed. Cow-pea, dhal and velvet bean can induce the germination of the parasite and these crops are recommended as possible trap crops.

[231] 633.71-2.951
HOROWITZ, B.; CROLL, R. D.; BELL, T. C. ***Nicotiana rustica* as an Australian field crop.** *J. Aust. Inst. Agric. Sci.* 14, 1948 (61-70).

Nicotiana rustica can be grown in many parts of Australia and produces raw material of high alkaloid content suitable for nicotine-sulphate production, for use as an insecticide. The physical state of the soil appears to be of major importance for the production of high-yielding crops.

633.73/4 COFFEE. CACAO

[232] 633.73-1.613
MONTEALEGRE, M. R. Practicas de conservacion de suelos observadas en El Salvador y Guatemala y posibilidades de su implantamiento en Costa Rica. [**Soil-conservation practices used in El Salvador and Guatemala and the possibility of introducing them into Costa Rica.**] *Rev Inst. Def. Café, Costa Rica* 19, 1948 (20-32). [Sp.]

For coffee plantations, young shoots of *Yuca elephantides* Regal set at depths of 20 cm. and 5-15 cm. apart in rows along the contour, gradually form a low palisade, against which a natural terrace builds up. *Sanseviera chyrsiflora* may also be used, but is harder to control. The danger exists that such plant barriers may harbour harmful insects. The construction of permanent bench terraces up to $1\frac{1}{2}$ m. wide is recommended when preparing new plantations in locations where the high initial cost of terracing is likely to repay itself. Ridging at gradients of 0.3-0.5% should also be useful for new plantings. The growth of tropical kudzu or crotalaria on ground intended for nurseries or new plantations is recommended, but crotalaria is not suitable as an anti-erosion cover in plantations, as it is not adapted to shade.

[233] 633.73-1.87
ALOISI, J. **Production of organic matter on the coffee plantation.** *Jornada Econ. Rur. An. 1942/43,* 1947 (388-402). Agric. Bibl. 12 (43). [Pt.]

[234] 633.74
CHEESMAN, E. E. **The outlook for cocoa production in Malaya and British Borneo.** *Rept. Cocoa Conf. London, Sept.* 1948 (26-34).

Soils and climate in Malaya, Sarawak and North Borneo are discussed from the point of view of cocoa production.

[235] 633.74
EVANS, G. **Cacao prospects in British Guiana and British Honduras.** *Rept. Cocoa Conf. London, Sept.* 1948 (6-12).

In these 2 countries, cacao should be treated more as an orchard crop and less as a forest crop because high yield per acre is essential.

[236] 633.74
FEAVER, W. R. **Cocoa production of the Ivory Coast.** *Rept. Cocoa Conf. London, Sept.* 1948 (19-21).

[237] 633.74
PALMA, M. **Some notes on the growing of cocoa in Venezuela.** *Rept. Cocoa Conf. London, Sept.* 1948 (66-69).

[238] 633.74
SCHWARZ, L. J. **Notes on cacao in the Western Hemisphere.** *Rept. Cocoa Conf. London, Sept.* 1948 (2-6).

Lands suitable to cacao culture are plentiful in the Western Hemisphere. Regions in Ecuador and in the Amazon and Orinoco valleys may soon be opened up with plants resistant to witches' broom and monillia disease.

[239] 633.74
URQUHART, D. H.; BEETON, W. H. **Cacao on the Gold Coast.** *Rept. Cocoa Conf. London, Sept.* 1948 (35-50).

Swollen-shoot disease and the question of alternative crops are discussed.

[240] 633.74
WEST, J. **Cacao in the British Cameroons area.** *Rept. Cocoa Conf. London, Sept.* 1948 (21-26).

Plantation cacao production, native production, soils, rainfall and future prospects for cacao in the Cameroons are discussed.

633.8 AROMATIC, MEDICINAL AND OIL PLANTS

[241] 633.812.424-1.5
AHMAD, G.-U.-D.; THIND, A. S. **Cultivation of rosha grass in the Punjab.** *Indian Farm.* 9, 1948 (184-186). [Punjab Agric. Coll., Lyallpur]

Rosha grass (*Cymbopogon martini* Stapf. var. *motia*) is grown for the production of the essential palmarosa oil. On poor soils farmyard manure or other fertilizer should be applied during the winter. Manuring rosha grass on rich soils produces thick stems and reduces the yield of oil.

[242] 633.815.427-1.5
KRISHAN, R. **Cultivation of *Khus* (*Vetiveria zizanoides*).** *Indian Farm.* 7, 1946 (578-580). [Cent. Sug. Cane Sta., Shahjahanpur]

Vetiveria zizanoides is a moisture-loving plant which grows wild in various parts of India. It is grown commercially in Java, South Africa, West Indies, etc., and is of great economic importance as every part can be utilized. In India so far the products are obtained from wild plants. It is suggested that it could be cultivated profitably on waste land. As its roots are the most valuable material it should be grown in soils suitable for root development; sandy soils called *Bhabar* are the best. The rhizomes or seeds should be planted at a distance of 4 ft × 4 ft. during rains, ploughed four or five times and well manured. Waste lands can be planted to *khus* and maintained at very little cost, particularly waste land situated near river banks.

[243] 633.853.55-2.3/4
HASHIOKA, Y. **The sick soil of castor beans (a preliminary report).** *J. Soc. Trop. Agric. Taiwan* 16, 1944 (105-109). R.A.M. 27 (450).

Sakuma, a variety of castor bean, almost died before maturity when the plants were raised twice consecutively in the same plot, and within two months when grown in pots to which was added a small quantity of sick soil or its filtrate. All grew normally in soil of ordinary rice fields, heat-sterilized sick soil and rice soil with the additional sick soil or a Berkefeld filtrate of the same. The soil sickness under continuous cultivation appeared to be due to soil-inhabiting parasitic organisms, chiefly *Fusarium ricini* and, to a lesser extent, *Bacterium solanacearum*.

[244] 633.854.56-1.5
WEBSTER, C. C. **A note on the cultivation and manuring of tung plantations (*A. montana*).** *Nyasaland Agric. Quart. J.* 7, 1948 (58-64).

Cultivation is important for tung during the first 3-4 years. Plantations intercropped with soybeans removed at harvest gave higher yields than those cropped with (a) maize dug in after harvest, (b) velvet beans dug in annually as green manure and (c) a cover crop of *Calapogonium mucunoides*. Trees that had developed thin yellow foliage and shoot dieback responded to applications of 4 lb. per tree of $(NH_4)_2SO_4$ and to dressings of compost containing cattle manure, but not to P or K. Applications of 100 lb. per tree of tung cake improved growth and cropping.

[245] 633.854.78-1.5
CHILDS, A. H. B. **Sunflower production in the Iringa District.** *E. Afric. Agric. J.* 14, 1948 (77-78).

Sunflower (*Helianthus annuus*) can be grown successfully in all areas where maize is grown. It is drought resistant and will give good yields on soils too poor and in seasons too dry, wet or cold for good maize yields. It does well on all types of soil from heavy clays to almost pure sand at altitudes of 3000 feet in arid thorn country to 7000 feet under forest conditions. It is an easily grown green manure, the stems and heads contain K and lime and it is an effective weed-smothering crop when broadcast at 45-55 lb. of seed per acre. It is susceptible to attack by eelworms and should not be grown in rotation with tobacco except as a trap crop. Cultivation follows the same lines as for maize, but one ploughing and disc-harrowing is sufficient. Very little cultivation is needed after the plants are 1½ feet high. The soil should be ridged around the plants at the first cultivation. Manure is not generally applied, but sunflowers should follow a crop that has been manured, usually maize.

[246] 633.883.85-2.192 : 546.711
DAJI, J. A. **Manganese toxicity as a probable cause of the *band* disease of areca palm.** *Curr. Sci.* 17, 1948 (259-260). [Coll. Agric., Poona]

The problem was investigated on a neutral to slightly acid, sandy, coastal alluvium containing magnetic oxide of Fe in regular bands 4-6 inches thick, with free water in the lower layers. $CaCO_3$ was absent from the top 3 feet; at this depth a hard compact layer of sand mixed with lime prevented free percolation of water. The soils were well supplied with N, P and K, were poor in lime and did not show excessive accumulation of soluble salts; those near diseased trees had less available P and K and contained much more total and available Mn than soils of healthy areas. All the Mn in the surface near diseased trees was in available form due to the prevalence of reducing conditions in the profile caused by partial waterlogging and to the absence of free $CaCO_3$ in the soil.

[247] 633.885.1-1.811
LOUSTALOT, A. J.; WINTERS, H. F. **The effect of three factorial levels of N and P on the growth and composition of *Cinchona Ledgeriana*.** *Plant Physiol.* 23, 1948 (343-350). [U.S.D.A., Mayaguez, P.R.]

The results of sand-culture experiments insofar as they are applicable to field conditions indicate that young cinchona trees are particularly sensitive to fertilizer balance. The P requirement of cinchona is low and growth may be limited under certain conditions if the P concentration is too high. P should be available in the proper proportion to N, the supply of which is important both for better growth and higher content of quinine and other alkaloids.

633.912 RUBBER

[248] 633.912-1.81
CAOUTCHOUC. Fumures des cultures d'hévéas. **[Manures for hevea-rubber plantations.]** *Caoutchouc* 3, 1948 (51-54). [F.]

Complete fertilizer containing N, P and K is the most efficient, followed closely by PK fertilizer. P fertilizers have the greatest influence on yields and their effect lasts more than a year. N fertilizers have the least influence.

634 ORCHARDS. FRUIT

(*See also* Abs. Nos. 350, 367)

[249] 634-1.427.3
SCHRADER, A. L. **Diagnosing the fertilizer needs for fruit plantings.** *Trans. Peninsula Hort. Soc.* 61, 1947 (70-78); *Bull. St. Bd. Agric. Dover, Delaware* 37, No. 5, 1947 (70-78). [Md. Agric. Expt. Sta. Dept. Hort.]

Deficiency symptoms of N, K, Mg, B, Ca, Zn, Fe, Cu, S and Mn are noted. Before considering the possibility of mineral deficiency, other causes of sickness in trees should be considered, such as excess soil moisture, insect injury, fungus disease and virus infection. In New England a tree might show Mg-deficiency symptoms, when the level of Mg in the leaf is less than 0.25%. The following steps in the diagnosis of fertilizer needs of orchards are suggested: visual examination, examination of underground conditions, quantitative analysis of leaves taken in July or August, and soil analysis of organic-matter content and pH.

[250] 634-1.5
PALMER, E. F.; VAN HAARLEM, J. R. **Orchard soil management.** *Ontario Dept. Agric. Bull.* 457, 1948, pp. 50. [Hort. Expt. Sta., Vineland Station]

Soil and plant relationships, plant nutrients, organic matter and humus, cover and green-manure crops, sod as a source of organic matter, clean cultivation, sod and sod-mulch systems, fertilizers and leaf diagnosis of nutritional needs are among the subjects discussed.

[251] 634-2.191
WALLACE, T. **Mineral deficiencies in fruit and vegetable crops.** *Occ. Publ. Sci. Hort.* No. 5, 1947 (3-9). [Long Ashton]

The elements essential to plant growth and the deficiencies occurring in fruit and vegetable crops in England are listed. These crops have much larger requirements for minerals than have farm crops. Methods of control and diagnosis of mineral deficiencies are noted and the use of fertilizer experiments on field crops is discussed.

[252] 634-2.191 : 546.47
MULDER, D. Carences zinciques chez des arbres fruitiers en Europe. **[Zinc deficiency in fruit trees in Europe.]** *C.R. Acad. Agric.* 34, 1948 (177-178). [F.]

Applications of $ZnSO_4$ and $ZnSO_4$+lime were effective in curing the disease which is probably caused by the formation of insoluble zinc phosphate by excess phosphates in the soil.

[253] 634.1/2-2.191 : 546.72
DAVISON, J. R. **Lime-induced chlorosis of fruit trees on the Murrumbidgee Irrigation Area.** *Agric. Gaz. N.S.W.* 59, 1948 (410-413).

Fruit trees growing on alkaline soils of pH 8.0-8.5, with very calcareous subsoils, showed symptoms of Fe deficiency following a season of very wet weather. Heavy leaching of soluble salts into the subsoil followed by increase in salinity in the top soil produced a state of unbalance in plant nutrients. Top dressings of Fe had only fleeting effect. Injections into the limb of 0.1% Fe salts improved the condition but the effect lasted for only one season. Better control of the disease was obtained with crow-bar hole plugs of 1½ lb. of iron sulphate sunk around the tree in contact with the roots, 18 inches deep and 6 feet from the butt of the tree.

[254] 634.1-1.5
UPSHALL, W. H. **Dwarf apple and pear trees in the home garden.** *Ontario Dept. Agric. Bull.* 456, 1948, pp.17.

Waterlogged soil should be avoided. Grass or plant-refuse mulch over the root area gives good protection in winter. Farmyard manure should be applied and if the trees are in sod ⅛-¼ lb. of N fertilizer for each year of the tree's age should be added early in spring.

[255] 634.1-2.191-1.811
MEIER-JECKLIN, K. Untersuchungen über ein nicht parasitäres Zurück- und Absterben von Obstbäumen im Kanton Graubünden. Ursachen und Mittel zur Abhilfe. **[Investigations into a non-parasitic dying-back and dying of fruit trees in the canton Grisons. Causes and control.]** *Ann. Agric. Suisse* 49, 1948 (193-272). R.A.M. 27 (530). [G.f.]

Apple and pear trees suffering from bare shoots and swollen bark and with poor fruit ultimately died as a result of almost complete lack of P and deficiency of K, B and N in the soil. The condition was aggravated by very low temperatures, excessive variation in temperature, excessive sunlight and lack of water.

Application of fertilizers including Mg improved affected trees.

[256] 634.1-2.191-1.811.3
MULDER, D. Gebrekszìekten van vruchtbomen. I. Kaligebrek. **[Deficiency diseases of fruit trees. I. Potash deficiency.]** *Tuinbouw* 2, 1947 (65-66). [Du.] [Lab. Zeelands Proeft.]

Symptoms of K deficiency, which may be confused with those of Mg deficiency or of wind and spray damage, in apple, pear and plum trees are briefly described. Owing to the wartime shortage of potash, K deficiency may become widespread and its effect is increased by heavy applications of N. Some soils, such as acid, lime-deficient river clays, contain sufficient K but deficiency symptoms appear owing to K fixation. While lime can favourably affect the availability of K, too heavy an application tends to prevent K uptake. Where 200 kg./ha. of K_2O are normally applied to keep the soil K at a constant level, deficient soils should be treated with 300-350 kg., or more if K fixation occurs.

[257] 634.1-2.191-1.811.6
MULDER, D. Gebrekszìekten van vruchtbomen. II. Magnesiumgebrek. **[Deficiency diseases of fruit trees. II. Magnesium deficiency.]** *Tuinbouw* 2, 1947 (268-270). [Du.] [Lab. Zeelands Proeft.]

Mg deficiency occurs on acid soils. Symptoms may be caused by actual deficiency in sandy soils but in clay soils are often the result of a disturbance in the K-Mg balance. Increased N, however, raises the uptake of Mg. Mg-deficiency can be controlled by manuring, but spraying with 2% $MgSO_4$ gives quicker results. Symptoms are described for several varieties of apples and for pears, which are less susceptible.

[258] 634.11-1.5
TAYLOR, H. V. **Modern methods of apple production.** *Farming* 2, 1948 (343-346).

[259] 634.11-2.191 : 546.46
WALLACE, T. **Note on the control of magnesium deficiency of apples.** *Long Ashton Agric. Hort. Res. Sta. Rept. 1947*, 1948 (58-61).

Annual dressings of $MgSO_4$ at 4-5 cwt./acre, using calcined Kieserite with MgO content of 20-30%, have cured Mg deficiency in 3-4 seasons in all except two areas. At one of the failure areas, 5 cwt./acre annually of Kieserite since 1940 visibly improved foliage and fruit size, but did not give healthy shoot growth. In another area where 5 cwt./acre of agricultural Epsom salts had been applied annually for 4 years and trees remained unsatisfactory, spraying in addition to soil treatment produced quick recovery. A single dressing of 2 tons/acre of high grade magnesian limestone had little effect on deficiency.

Trials with injections of solid calcined Kieserite showed that sufficient material could not be introduced into the trees to remedy the deficiency. 3-5 fortnightly foliage sprayings with 2% calcined Kieserite or 2% solution of agricultural Epsom salts, beginning at petal fall, gave good results.

[260] 634.11-2.191-1.811.6
ASKEW, H. O.; KIDSON, E. B. **The control of magnesium deficiency of apple trees in the Nelson district, New Zealand.** *N.Z. J. Sci. Tech.* 29A, 1948 (247-255). [Cawthron Inst. Nelson, N.Z.]

The use of ground dolomite and magnesium carbonate has maintained apple trees in a satisfactory condition for seven seasons. Magnesium sulphate was less efficient. Applications of these compounds in a second season gave still better results. Dolomite at the rate of 6 lb. per tree appeared to be sufficient and there was no advantage in increasing the amount. Some symptoms of Mg deficiency usually appeared on the trees before the end of the season notwithstanding the treatment with Mg compounds. But the damage was slight and although the control of the deficiency was not complete it was quite effective commercially.

[261] 634.22/3-1.5
MINISTRY OF AGRICULTURE. **Plums and cherries.** *Min. Agric. Bull.* 119, 1948, pp. 74.

Site, soil, climate, orchard management, soil management, drainage, manuring and pest and disease control are discussed.

[262] 634.25-1.5
SHAH, S. M. I. **How to raise peach trees?** *Indian Farm.* 7, 1946 (584-585). [Agric. Dept. N.W.F.P., Tarnab]

The land is prepared by ploughing once with a soil-inverting plough, followed where necessary with a clod crusher, and is then levelled and cultivated with a *desi* plough. 32 cart loads of well-decayed farm manure per acre should be applied with a *desi* plough. Manure can also be hoed in as a top dressing immediately after the seeds have germinated. The first irrigation is given just after germination has started. Subsequent irrigations during June, July and August are given at intervals of about 14 days. Irrigation should be given immediately before budding has started. Four to six hoeings are necessary to keep weeds down.

[263] 634.25-2.191-1.811.3-1.544.7
BAKER, C. E. **Effectiveness of some organic mulches in correcting potassium deficiency in peach trees on a sandy soil.** *Proc. Amer. Soc. Hort. Sci.* 51, 1948 205-208). [Purdue Univ. Agric. Expt. Sta.]

Manure, soybean hay and straw mulches all corrected K deficiency in peach trees. Young apple trees in the same planting in which peach trees showed severe K-deficiency symptoms, did not appear to be affected.

[264] 634.3-1.347.24
KEMP, H. K.; HALLIDAY, O. E.; SPURLING, M. B. **Sprinkler irrigation investigation.** *J. Dept. Agric. S. Aust.* 52, 1948 (19-23). [Hort. Br., S. Aust. Dept. Agric.]

Great differences in precipitation occurred at the skirt of citrus watered with the combined-heads types of sprinkler. Watering mature citrus with these types of sprinkler presents the problem of "drip-ring" precipitation, which varies from 2 to 4 times the uniform rate being applied. On light sands with high intake rates the question will probably not arise, but on stiffer soils preparation of the soil surface is necessary. Stone-fruit plantings do not apparently present the same difficulty as there is no concentrated drip and tendency to break which is seen under citrus.

[265] 634.3-1.5
KEBBY, R. G.; SKEPPER, A. H. **Citrus fruit quality. What are the main considerations?** *N.S.W. Agric. Gaz.* 59, 1948 (357-362).

After soil and climate, farm practice is of importance in the production of marketable fruit. The ideal for cultivation is to aim at

the minimum amount necessary for control of weed growth. Irrigation should supply water (only when the trees need it) to the root-zone area of the soil, which rarely extends below 2 feet 6 inches from the surface, and on heavy soils is mainly confined to the top 20 inches. Maintenance of the N level is a universal problem and $(NH_4)_2SO_4$ forms the basis of all recommended fertilizer programmes. Deficiencies of Zn, Cu, Mn and Mg are particularly common on the light sandy soils of the coast and inland citrus areas.

[266] 634.3-2
MARTIN, J. P. **Effect of fumigation, fertilization and various other soil treatments on growth of orange seedlings in old citrus soils.** *Soil Sci.* 66, 1948 (273-288). [Univ. Calif. Citrus Expt. Sta.]

The cause of reduced growth of orange and lemon trees in old citrus soil is specific for citrus and is probably not the result of any common nutrient deficiency. The possibility is not excluded however that the available supply of some trace element required by citrus and not by other plants is used up in time and causes reduced growth. Although microbial factors are probably partly responsible for the reduced growth of trees of a second or third planting of citrus in old orchards, other factors, such as the presence of some toxic material, may also be involved. Application of soil fumigants markedly stimulated growth of sour and sweet orange seedlings in old citrus soil but did not increase growth to a point comparable to that of plants in untreated or fumigated non-citrus soil.

[267] 634.31-1.811.1 : 577.16
JONES, W. W.; PARKER, E. R. **Ascorbic acid-nitrogen relations in navel orange juice, as affected by fertilizer applications.** *Proc. Amer. Soc. Hort. Sci.* 50, 1947 (195-198). [Citrus Expt. Sta., Riverside, Calif.]

There was an inverse correlation between N and ascorbic acid, and the amount of N in the juice varied with the amount of N in the fertilizer. The addition of organic matter with the fertilizer decreased significantly the amount of N in the juice, but had no effect on the ascorbic-acid content.

[268] 634.573
OLIVEIRA, A. O cajueiro. **[Cashew.]** *Bol. Sec. Agric. Pernambuco* 14, 1947 (271-273). For. Abs. 10 (31). [Pt.]

In the direct sowing of cashew (*Anacardium occidentale*), the most successful and economical method, two or three seeds are sown in one hole and the two weakest seedlings removed after two months. The spacing recommended is 2 m. × 2 m. but should be greater where the trees are grown primarily for fruit. Cashew grows quickly, does not require much moisture and is suitable as a shade tree for coffee. If it is to be grown a year or more before coffee, interplanting with annual crops such as tapioca, cotton or tomato is recommended. Cashew thrives on siliceous soils and is suitable for windbreaks and hedges and sand-dune fixation.

[269] 634.58-1.421
BANCROFT, T. A.; WILSON, C.; WILSON, J. P. **Size and shape of plots and distribution of plot yield for field experiments with peanuts.** *Ala. Agric. Expt. Sta. Prog. Rept. Ser.* 39, 1948, pp. 7. Mimeo.

From a study of relative efficiencies it was noted that increasing the size of the plot along the row was much more efficient than across the row. Plots of one row width and $16\frac{2}{3}$ feet in length were the most efficient. If plots were increased in length to over $33\frac{1}{3}$ feet with one row width or more, there might be a decrease in efficiency.

[270] 634.651-2.4
LOEST, F. C. **Plant diseases and cultural operations.** *Farm. S. Africa* 23, 1948 (304-307, 324). [Hort. Res. Sta., Nielspruit]

Pawpaw trees damaged by frost or hail are often heavily attacked by anthracnose stem rot, *Gloeosporium papayae* P. Henn. If damaged trees are at once irrigated and well fertilized with N, the disease will cause little damage to the trunks.

[271] 634.7-1.5
STRONG, W. J. **Currants and gooseberries.** *Ontario Dept. Agric. Bull.* 440, 1948, pp. 19. [Hort. Expt. Sta., Vineland Station]

Subjects discussed include soil and location, cultivation, mulching, fertilizers and diseases and insect pests.

[272] 634.75-1.5
STRONG, W. J. **The strawberry in Ontario.** *Ontario Dept. Agric. Bull.* 458, 1948, pp. 28. [Hort. Expt. Sta., Vineland]

The soil should be acid and have a high moisture-holding capacity and a good supply of organic matter. Light soils are easy to work, are early and provide a good bed for rooting, but they are low in organic matter. 20 tons/acre of farmyard manure or 6 tons of hay or straw + green manure or 300 lb. of $NaNO_3$ should be worked well into the soil in the year before planting. When soybeans are used for green manure, root-rot disease is less serious. In the spring before planting, 400 lb./acre of super. + 200 lb. of K_2O or 600 lb. of 0-12-10 fertilizer should be applied with green manure. 150 lb. of $NaNO_3$ should be added when the plants are well established. $(NH_4)_2SO_4$ cannot be applied safely to foliage. Root rot can be avoided by growing strawberries for only 1 in 5 years on the same land. 2,4-D used at half the commonly recommended strength kills small weeds. In the first year it may be applied at any time, but in the fruiting year it should not be applied until after the harvest.

Questions of mulching, renewing the plantation, irrigation, insect pests and diseases are discussed.

[273] 634.771-2.4
MERNY, G. La maladie de Panama des bananiers. **[Panama disease of bananas.]** *Fruits d'Outre Mer* 3, 1948 (211-215). R.A.M. 27 (533). [F.]

Fusarium oxysporium var. *cubense* invades the roots and rhizomes of the banana. The ecology of the infection with regard to soil humidity, acidity and ventilation and methods of control by quarantine, soil disinfection, use of resistant varieties and soil amelioration are discussed.

[274] 634.774-1.5
GROSZMANN, H. M. **Pineapple culture in Queensland.** *Queensland Agric. J.* 67, 1948 (78-100).

The pineapple cannot stand poor aeration and prefers a soil rich in decaying plant matter which helps to provide the acid conditions, mineral nutrients and the even temperature and moisture which the roots require. One of the most important factors in pineapple production is the seasonal distribution of rainfall. In southern Queensland damage is caused by excessive late summer rains which lead to waterlogging. At temperatures of 90°F. and over the fruit is liable to sun-burning. Heavy liming is harmful as it tends to make Fe unavailable to the plant. The optimum pH range is 4.5-5.0. The pineapple requires a relatively high level of N and K with a low level of P. Of the trace elements, the pineapple may suffer from a deficiency of Cu, Zn or Fe. Fe deficiency caused by excess Mn in the soil sometimes occurs on red basaltic soils.

[275] 634.776-1.5
WILLS, J. M. **Passion fruit growing in Southern Queensland.** *Queensland Agric. J.* 66, 1948 (325-350).

The coastal climate of southern Queensland is very suitable for passion fruit which requires warm, humid conditions. Soils for successful vine growing range from rich rain-forest to light-scrub and forest soils, these last two types being the most suitable, as the rain-forest soils encourage rank growth. Lime at the rate of $\frac{1}{2}$ to 1 ton/acre is beneficial on the coastal soils, which are deficient in lime. As passion vines are comparatively shallow rooted, cultivation should be shallow during the main growing and fruiting periods and should be confined to weed control and prevention of caking. The growing of cover crops is recommended. Irrigation is also necessary. A 10-6-10 mixture of $(NH_4)_2SO_4$, super. and K_2SO_4 produces good crops. Farmyard and poultry manure should be used whenever available.

[276] 634.8-1.427.3
MAUME, L.; DULAC, J. Nouvelles observations sur la nutrition de la vigne controlée par l'analyse chimique de la feuille. **[New observations on the nutrition of vines controlled by chemical analysis of the leaf.]** *C.R. Acad. Agric.* 34, 1948 (861-864). [F.]

All manuring of vineyards is controlled by preliminary foliar analysis of the vine leaves. A regional survey of the nutritional requirements of grape vines was conducted in 1946 and 1947.

[277] 634.8-1.51
MANUEL, H. L. **The planting of grape vines. Suitable soils and good management are essential to success.** *N.S.W. Agric. Gaz.* 59, 1948 (380, 390).

Before land is planted with grape vines it should be thoroughly prepared by deep working to 14-18 inches. Soil unsuitable for deep working should not be planted to vines. Land can be gradually "deepened" by the growing of annual crops for some years before planting with vines, each ploughing being deeper than the previous one. A sub-soiler could work the layers below 18 inches. A dressing of lime to the trenched soil would not be amiss on heavy soils.

634.9 FORESTRY

(*See also* Abs. Nos. 69, 315)

[278] 634.9-1.4-1.878
TRYON, E. H. **Effect of charcoal on certain physical, chemical and biological properties.** *Ecol. Monog.* 18, 1948 (81-115). For. Abs. 10 (16).

Using brown podzolic forest soils the absorption of moisture by charcoal and the effects of charcoal on the physical and chemical properties, germination of *Pinus strobus* seed, growth, mycorrhiza and damping off of *Pinus strobus* seedlings and soil microfauna were studied. The presence of charcoal altered several physical and chemical properties of forest soils but had little influence on the development of conifer seedlings.

[279] 634.9-1.471
COLMON, E. A. **Soil surveying on wildlands: the problem and one solution.** *J. Forestry* 46, 1948 (755-762). [Calif. Forest and Range Expt. Sta., Berkeley]

The type of soil survey ordinarily conducted on agricultural lands is often not applicable to wildlands. Surveys in land-management practice can be made (1) by limiting direct measurements to the particular soil characteristics necessary for the administration of the area concerned and (2) by classifying and mapping soils broadly. The soil survey of the Angeles National Forest is described in which wildland soils were mapped on the basis of their hydrology. Geology and topography were used as a basis of classification, and soil depth, texture and profile development were used in so far as they established water-storage, water-transmitting and erosion characteristics of the soils.

[280] 634.9-1.589
WICHT, C. L. **A statistically designed experiment to test the effects of burning on a sclerophyll scrub community. I. Preliminary account.** *Trans. Roy. Soc. S. Africa* 31, 1948 (479-501). [Forest Res. Off., Jonkershoek, Stellenbosch]

[281] 634.957-1.466.1
BALDACCI, E. Alcuni aspetti del rimboschimento in relazione al fenomeno della micorrizia. [**Some aspects of afforestation in relation to mycorrhiza.**] *Ital. For. Mont.* 3, 1948 (67-72). For. Abs. 10 (16). [I.]

A brief review, especially of British and American work.

[282] 634.957-1.62-1.512
CASSON, P. B. **Some observations on mound ploughing in the establishment of radiata pine.** *Aust. For.* 11, 1947 (40-43). For. Abs. 10 (45).

In the establishment of *Pinus radiata* on badly drained, waterlogged sites in S. Australia, lines are ploughed across the contour with a heavy disc plough and the trees planted on top of the over-turned soil. If the site is very low-lying, a second plough line is run in the opposite direction, a few feet from the first, thus turning the second lot of soil on top of the first; the height of planting is thereby increased and drainage provided in a furrow on either side. This process is known as mound ploughing. After heavy rains surplus water may have to be assisted from the furrows into the natural drainage system by digging through the mounds at the point of collection. The disadvantages of line ploughing are that the soil may plough in the form of long turves which lie with an air space between them and that destruction of plant competition is not complete. Mound ploughing disturbs the ground more thoroughly, destroys more competing plants and may be essential on very swampy sites.

[283] 634.97-1.4
ALINARI, E. **The effects of the vegetation on the forest soil in our climates.** *Italia Forest. Mont.* 3, 1948 (212-214). C.A. 42 (9021). [Univ. Florence]

Results of analyses of beech-tree and spruce-tree soils of Tuscany are given. Contrary to findings for northern forests, there was no distinct difference between the two soils.

[284] 634.97-1.416
UGARTE LAISECA, J. Fitoquimica forestal. I. Estudio general y de los elementos del grupo A. [**Plant chemistry in the forest. I. General considerations and a study of the elements of group A.**] *Bol. Inst. Investig. Expt. Madrid* 18, 1947, pp. 87. For. Abs. 10 (34). [Sp.f.e.g.]

The relationship between forest vegetation and the chemical composition of the soil is examined. The ash content of the plant varies with species, part of the plant, season, soil composition and other factors; these variations and the rôle of soil pH in plant nutrition are discussed.

[285] 634.972.3-1.4
STOECKELER, J. H. **The growth of quaking aspen as affected by soil properties and fire.** *J. Forestry* 46, 1948 (725-737). [Lake States Forest Expt. Sta., St. Paul, Minn.]

Best quality and size of quaking aspen (*Populus tremuloides*) were obtained on good sandy loams and silt loams with limy subsoils or parent materials. On very heavy or very sandy soils, development was poor. Permanent water tables at 3-7 feet below the surface of light soils improved the quality. Aspen areas repeatedly burned showed only 30% as much valuable understorey reproduction as did unburned areas.

[286] 634.975-2.4-1.5
BOGGESS, W. R.; STAHELIN, R. **The incidence of fusiform rust in slash pine plantations receiving cultural treatments.** *J. Forestry* 46, 1948 (683-685). [Ala. Agric. Expt. Sta., Auburn]

Slash-pine plots were cultivated and fertilized with 0.3 lb. per tree of 1-5-4 fertilizer and a side dressing of 0.1 lb. of $NaNO_3$. In some plots cotton was planted between rows, and an additional application of 325 lb./acre of 6-8-4 fertilizer was made, but this gave no appreciable difference in diameter over the cultivated and fertilized plots. Cultivation and fertilization increased the diameter of the trees by 50%, but it also increased by 4 times the number of *Cronartium fusiforme*-infected trees. It is likely that the cultural treatments caused an early break in winter dormancy, resulting in the production of rust-susceptible tissue at the time of peak production of sporidia of the fungus.

635 HORTICULTURE

(*See also* Abs. Nos. 98, 251, 333, 365)

[287] 635 : 577.15.04
SWARBRICK, T. **A review of recent researches on growth-promoting substances in horticulture.** *Occ. Publ. Sci. Hort.* No. 5, 1947 (27-39). [Long Ashton]

Review of work at Long Ashton since 1939.

[288] 635-1.811
WALLACE, T. **Nutrition problems of horticultural plants, with special reference to trace elements.** *J. Roy. Hort. Soc.* 73, 1948 (366-380, 423-428).

The main practical problems concerned with deficiencies and excesses of the individual elements. relationships between certain of them and also the different methods of determining the mineral status of plants are discussed. In discussing soil conditions conducive to trace-element deficiencies and excesses the importance of pH and organic matter is stressed.

[289] 635-1.86
GERICKE, S. Humusfragen im Gemüsebau. [**Humus and vegetable cultivation.**] *Ztschr. Pflanz. Düng.* 37, 1946 (151-165). [G.]

A neutral loamy sand received basal NPK annually, with or without 400 dz./ha. of farmyard manure every third year. Cucumbers and cabbage types gave the highest yield increases and bulb and root vegetables gave the lowest, while podded vegetables were intermediate. Taking all crops together, the average increase in yield over 9 years due to the manure was 19%. The residual values were 50% and 26% in the second and third years and were almost entirely due to the contained minerals;

responsive crops in the rotation were therefore planted in the manuring year and the least responsive in the third year. The need and justification for higher applications of manure in vegetable than in arable culture clearly appeared in that (1) manure was more completely utilized in vegetable culture and (2) vegetable crops provided only about $\frac{1}{3}$ of the weight of crop residues given by arable crops. The organic part of the manure was rapidly decomposed : the water-holding capacity and permeability were improved only in the year of application and in 9 years only 10% of the applied organic matter remained in the soil.

[290] 635.5-1.5
MINISTRY OF AGRICULTURE. **Outdoor salad crops.** *Min. Agric. Bull.* 55, 1948, pp. 42.

Soils, irrigation, preparation of site, seed beds and land for planting out, and pests and diseases are discussed.

[291] 635.64-2.191-1.811.6
NICHOLAS, D. J. D. **Experiments on correcting magnesium deficiency in glasshouse tomatoes.** *J. Hort. Sci.* 24, 1948 (1-18).

Experiments were made at 4 centres differing in cultural and manurial treatments and included a number of tomato varieties. A minimum of 10 cwt./acre of calcined kieserite (20% MgO) applied to the soil was necessary to achieve a cure of commercial value. Foliage sprays were superior to soil application, both as regards economy and efficiency. Large proportions of the heavy soil dressings were unavailable to the plants. The application of $MgSO_4$ in solution to the roots proved also less effective than the foliage-spray treatments and was similar in effect to applications of the solid form to the soil at the same rate. The incidence of Mg deficiency was reduced by application to the soil of calcined kieserite with or without potash.

[292] 635.64-2.3-1.43
KENDRICK, J. B., JR.; WALKER, J. C. **Predisposition of tomato to bacterial canker.** *J. Agric. Res.* 77, 1948 (169-186). [Wis. Agric. Expt. Sta.]

Tomato plants were predisposed to various environments for a 30-day period before inoculation with *Corynebacterium michiganense* (Sm) H. L. Jensen. Plants predisposed at a soil temperature of 24°C. and air temperature of 20° succumbed to the disease less rapidly than at higher or lower soil temperatures. With air temperature of 24° and soil temperatures slightly lower, the disease progressed less rapidly than in plants at higher or lower air temperatures. Plants grown at optimum soil moisture succumbed more rapidly than at higher or lower soil moistures in a given soil. The predisposing effect of soil and air temperature and soil moisture on the host plant in its reaction to the canker pathogen was opposite to that of the same factors in the reaction of the plants to the fusarium wilt organism.

[293] 635.656-1.461.52
BOND, L. **Origin and developmental morphology of root nodules of *Pisum sativum*.** *Bot. Gaz.* 109, 1948 (411-434). [Univ. Wis.]

The development and structure of the nodules of *Pisum sativum* were studied on plants grown from sterilized, inoculated seeds planted in sterile gravel.

[294] 635.935.79-1.81
MCCLELLAN, W. D.; STUART, N. W.; CLARK, K. G. **Flower and corm production of gladiolus as affected by fertilizer applications in the greenhouse and in the field.** *Amer. Fert.* 109, No. 4, 1948 (9).

N was most important for growth and production of gladiolus. Growth of corms was limited in the second year by deficiency of P and K, and no cormels were produced from B-deficient plants. Flowering date was not affected by fertilizer treatment, but flower spikes were smallest from corms receiving low N.

[295] 635.939.72-2.2-2.953
TARJAN, A. C. **The inefficacy of ethylene chlorobromide as a therapeutic agent in the treatment of gardenias infected with the root-knot nematode.** *Phytopath.* 38, 1948 (845-847). [Agric. Expt. Sta., College Park, Md.]

Applications of 0.05-0.40 ml. per plant of ethylene chlorobromide were not effective in killing *Heterodera marioni* (Cornu) Goodey. The fumigant may have weakened the resistance of the plant, or it may have killed the natural enemies of the nematodes or stimulated the development of parasites.

GEOGRAPHICAL

(4) EUROPE

(*See also* Abs. Nos. 13, 215)

[296] (41/42)63
BROOKS, F. T.; DALLING, T.; OGG, W. G. **A survey of some outstanding problems in agricultural science in the Empire.** *Roy. Soc. Emp. Sci. Conf. Rept. 1946*, 1, 1948 (308-322).

[297] (41/42)63
FILMER, F. J.; HAMILTON, W. M.; SMALLFIELD, P. W. **A survey of the main problems in agricultural science and its application to various parts of the Empire.** *Roy. Soc. Emp. Sci. Conf. Rept. 1946*, 1, 1948 (337-346).

[298] (42)632.191
PLANT, W. **A survey of trace element and magnesium deficiencies of crops in some counties of England.** *Occ. Publ. Sci. Hort.* No. 5, 1947 (23-26). [Long Ashton]

Few soils exist in England that are really short of trace elements, though soil conditions may render them unavailable. Acid soils do not tend to show deficiencies of trace elements. In acid soils of pH 5 or below, sufficient Mn may be present to be toxic to plant growth. Drought affects the incidence of B and Mn deficiency.

[299] (426)631.4 : 581.5
LAMBERT, J. M. **A survey of the Rockland-Caxton Level, Norfolk.** *J. Ecol.* 36, 1948 (120-135). [London Univ.]

The Rockland-Caxton Level is an embanked and drained grazing area in the Yare Valley. It has degraded considerably during the past 35 years owing to increased difficulty of drainage, and much of the area remains waterlogged throughout the winter. The substrate consists of estuarine clay, peat or a mixture of both. A serious attempt is being made to reclaim the Level, but so far this has not affected the vegetation. *Juncus subnodulosus* was the most widepread species, but was less frequent on the clay areas and shallow peat, while *Glyceria maxima* was most conspicuous on the pure clay, but was restricted to the vicinity of the dykes in the pure peat areas. On the adjacent "mowing marshes" *Phragmites communis* was the most prominent constituent while *Juncus* was very limited and *Glyceria* showed no marked difference in constancy between mown and grazed areas. The major differentiating factor between *Juncus* and *Glyceria* was presumed to be the renewal of mineral supply by the circulating tidal water which was excluded in the Level.

[300] (436)631.459 : 631.61
WAGNER, H. Naturschutz und Kulturmassnahmen in der "Feuchten Ebene" des Wiener Beckens. [**Nature protection and cultural measures in the "moist plain" of the Vienna basin.**] *Natur u. Land* 33/34, Nos. 3/4, 1947 (87-94). Biol. Abs. 22 (1199). [G.]

Discusses the danger of drought and dust-bowl conditions threatening the Vienna basin as a result of drainage. Planting of protective hedges and restoration of forests and meadows are suggested.

[301] (437)631.445.52/3
PELÍŠEK, J. Solné púdy Jižzí Môravy. [**Saline soils in Southern Moravia.**] *Sborn. Vys. Škol. Zeméd. v Brně* C42, 1948, pp. 24. [Cz.e.]

[302] (438)631.4
DOBRZAŃSKI, B.; PISZCZEK, J. Badonia gleboznaweze terenów Sośnica. [**Studies of soils of the Sosnica area.**] *Ann. Univ. Mariae Curie-Skłodowska* 11, 1947 (263-284). [Pl.e.]

Acid degraded loess soils predominate, but neutral or alkaline sandy loam covers most of the alluvial area.

[303] (44)631.85
GAROLA, J. Observations et expériences sur le role de la fumure phosphatée en Eure-et-Loir. [**Observations and experiments on the role of phosphatic manure in Eure-et-Loir.**] *Ann. Agron.* 18, 1948 (452-461). [F.] [Sta. Agron. Chartres]

[304] (45)63 : 33
ISTITUTO NAZIONALE DI ECONOMIA AGRARIA. **The situation of agricultural economics in Italy.** *Ist. Naz. Econ. Agrar.* 1948, pp. 47. [E.]

[305] (45)631.459 : 631.61
OLIVA, A. L'erosione del suolo e gli schemi fondamentali di difesa. [**Soil erosion and fundamental control schemes.**] *Ital. Agric.* 83, 1946 (143-152). [I.]

In Italy 4 types of erosion are listed: (1) denudation by frost and thawing, (2) *dilavamento* or washing out by the action of water on low-lying ground and slight slopes (low hills, plateaus, valley bottoms, etc.), (3) wind erosion principally occurring in Libya, (4) erosion in the usually recognized sense, i.e., erosion caused by water combined with thermal action on soils with low resistance. The history of erosion control in Italy is said to go back to the 17th century, being mentioned by Viviani, a pupil of Galileo, but Italy still lacks a centre for the scientific study of erosion.

[306] (45)633.18-1.5
PIACCO, R. [**Cultural studies of principal varieties of rice in Italy.**] *Risicoltura* 36, 1948 (27-33, 60-64, 91-95, 107-112). B.A.BIII, 1948 (315). [I.]

Experiments on medium marshy or alluvial irrigated soil under rice during the past 15 years are recorded.

[307] (471)553.97
SOVERI, U. Eraïden turvelajiemme kemiallisesta kokoomuksesta ja sen vaikutuksesta nüden polttoarvoon. [**The chemical composition of some varieties of Finnish peat and its influence on their calorific value.**] *Maat. Aikak.* 20, (81-100). [Fi.]

[308] (481)631.411.4 : 631.62
LÅG, J. **Investigations of a peatland, part of which has been subjected to a natural draining.** *Medd. Norske Skogforsøksv.* 9, 1947 (459-480). For. Abs. 10 (25). [E.n.]

The probable history and present vegetation of the Frebergsmyra, Vestfold are discussed with special reference to a portion which has been naturally drained by subterranean watercourses developed probably in the thin layer of mineral soil between the peat and surface of the bedrock.

[309] (485)63
ÅKERMAN, Å. Det skånska jordbruket och dess anpassning till tidsläget. [**The agriculture of Scania and its adaptation to the present situation.**] *Kgl. LantbrAkad. Tidskr.* 87, 1948 (239-252). [Sw.e.]

Scania comprises only 2.7% of the total area of Sweden, but has 15.2% of the total area of cultivated land and 20-25% of the total vegetable and animal production of the country. Oats have decreased in importance in favour of new cash crops such as rape, flax and mustard for oil, vegetables and fruit. Potato growing is still of first importance in the eastern districts and 90% of Swedish sugar is still produced in Scania.

[310] (492)631.47
EGBERTS, H. De bodemkartering in de Betuwe. [**Soil mapping in the Betuwe.**] *Geld. Landb.* 13, 1948, (11). [Du.]

The soils of the Betuwe district are described under the headings of river, basin, old arable, ploughed, old stream-bed and diluvial types.

[311] (492)631.473
PIJLS, F. W. G. De bodemkartering van Nederland. 1. Een gedetailleerde bodemkartering van de gemeente Didam. [**Soil survey of Holland. 1. A detailed soil survey of the Didam community.**] *Versl. Landbouwk. Onderzoek.* No. 54, 1948 (1-116). [Du.e.]

[312] (492)631.811.4 : 631.557
CASTENMILLER, G. M. De betekenis van de kalktoestand van het Nederlandse bouwland voor de toekomstige productiemogelijkheden van de akkerbouw. [**Increasing the production of arable land in the Netherlands by improving the lime status of the soil.**] *Landbouwk. Tijdschr.* 60, 1948 (92-106). [Du.e.] [Landbouwproefsta. Bodemk. Inst. T.N.O., Groningen]

The relationship between lime status and yields was determined by surveying the analyses of 110,000 soil samples from different areas. The potential increase of production was calculated from the average depression of yield on soils with an insufficiently high pH and from the percentages of these soils of the total areas. On sandy and moor soils the best average results were given at pH 5.6 and on clay soils at the highest pH found, except for potatoes, the yields of which were depressed above pH 7.

The pH was generally higher in the south of the Netherlands than in the north. The humus contents of these soils, 9 and 4.5% respectively, probably account for the difference. The river-clay, acid marine-clay soils of Groningen and Friesland and loess soils were especially deficient in lime.

To obtain the highest yields 29% of the sandy soils and 25% of the clay soils should be limed; this should increase average yields by 12 and 10% on sandy and clay soils respectively, and give a total increase corresponding to the normal yield of about 33,750 ha. of arable land.

[313] (492)633.52-1.5
FRIEDRICH, J. C. De teelt van olievlas. **[Cultivation of flax as an oil plant.]** *Maandbl. Landbouwvoorld.* 5, 1948 (12-20). Rev. Int. Indagr. 9 (120). [Du.]

The possibilities of growing linseed in Holland are discussed.

[314] (494)633.71-1.81
HUTER, R. La fumure du tabac en Suisse. **[Tobacco manuring in Switzerland.]** *Rev. Int. Tabacs* 22, 1947 (51-59). Rev. Int. Indagr. 8 (445). [F.]

[315] (494)634.975-1.4
KUNZ, R. Einige Gesichtspunkte zum Lärchenanbau im Jura der Nordwestschweiz. **[Some points of view on the growing of larch in the Jura of Northwest Switzerland.]** *Schweiz. Ztschr. Forstw.* 99, 1948 (49-55). For. Abs. 10 (33). [G.f.]

Investigations in the Jura of Basle on the relationships between the growth of larch and certain site factors indicate that physical soil characteristics are more important than chemical differences due to variations in the parent material. The best-quality larch was found on permeable, well aerated, deep, fairly moist soils. With increasing gradient there was increased crown competition among the dominants and on steep slopes larch suffered competition from its own kind and from less tall species such as beech. On flatter land larch outstripped other species. Height was less on the shallow drier soils of the hill tops than on the fertile soil at the foot of the slopes, but the difference was not so pronounced as in other species.

(5) ASIA

(*See also* Abs. Nos. 51, 234, 241, 248)

[316] (51)55
LI, H.-F. **Bibliography of Chinese geology. Bibliography of geology and geography of Sinkiang.** *Nat. Geol. Surv. China,* 1947, pp. 213.

[317] (52)631.81
SCHENCK, H. G. **Natural resources problems in Japan.** *Science* 108, 1948 (367-372). [Nat. Resources Sect., G.H.Q., Supreme Commander Allied Powers, Tokyo]

Increased food production, which is the most pressing single problem in Japan, is hindered by low soil fertility, shortage of fertilizers, scarcity of unused arable land, and plant diseases. Before the war, Japan was one of the world's largest consumers of commercial fertilizer, and land reclamation and growth of the population make present fertilizer requirements even greater. High priority has been given to the importation of NH_4NO_3, phosphate rock and K salts, and to the rehabilitation of factories for the production of fertilizers. Phosphate rock is being mined in Angaur Island.

Reclamation projects have added 770,000 acres of arable land, and improvement projects 250,000 acres, to the cultivated acreage. In addition 3,000,000 acres of uncultivated nonforested slopes are being investigated as possible pasture and forage lands. A reconnaissance soil survey has been almost completed.

[318] (52)631.863
SWANSON, C. L. W. **The use of composts, night soil and unusual fertilizers in the soil fertility program of Japan.** *Amer. Fert.* 109, No. 4, 1948 (24). [Conn. Agric. Expt. Sta., New Haven]

The common method of making composts is described. Information is given on the storage and application of night soil and on the survival period of pathogenic organisms in stored and applied material. Rates of application for important food crops grown in Japan are recommended.

[319] (527.1)631.4
LASHKOV, A. N. **[Morphology of the soils of the southern Kuril Islands.]** *Vsesoiuz. Geog. Obshch. Izv.* 80, No. 1, 1948 (61-68). Agric. Bibl. 12 (42). [R.]

[320] (54)63
HUSAIN, A. **A survey of some outstanding problems in agricultural science in India.** *Roy. Soc. Emp. Sci. Conf. Rept. 1946,* 1, 1948 (347-361).

Irrigation, dry farming and manures are discussed.

[321] (54)631.4
MUKERJI, B. K.; AGARWAL, R. R. **Studies in Gangetic alluvium of United Provinces. II. Soils of Sandila tahsil in Hardoi district.** *Indian J. Agric. Sci.* 17, 1947 (1-13).

3 soil types are recognized and their morphological, chemical and other properties are discussed.

[322] (54)631.416 : 619
LALL, J. M. **Common mineral-deficiency diseases of farm animals.** *Indian Farm.* 8, 1947 (233-236). [Indian Vet. Res. Inst., Izatnagar]

Various causes of mineral deficiencies are mentioned. One is a deficiency of minerals in Indian soils owing to the export of large quantities of lime and P in the form of bone, no return being made to the soil by the addition of chemical fertilizers. Other important factors in the creation of soil deficiencies are soil erosion, excessive rain and injudicious systems of agricultural practice. Fodders grown in a large part of the country are deficient in lime and P.

[323] (54)631.582 : 631.459
JENKINS, W. J. **Contour cultivation and strip cropping.** *Indian Farm.* 8, 1947 (103-105).

A plea is made for a revision and adaptation of fields and crop rotations in India.

[324] (564.3)631.671 : 546.13
McDONALD, J. **Chemical investigations.** *Cyprus Dept. Agric. Rept. 1947*, 1948 (9).

The structure of irrigated soils is good, and accumulation of chloride in the first foot does not exceed 0.032% except when water containing 0.024% of chlorides is used. This water damaged potatoes, but lucerne and olive trees were not affected. Under the conditions in which irrigation is practised in Cyprus there is little risk of salt damage to soils.

[325] (569)631.411.4
RAVIKOVITCH, S. **Peat soils and soils rich in organic matter in the Huleh valley.** *Agric. Res. Sta., Rehovot Bull.* 47, 1948, pp. 32.

[326] (569)634.22-1.5
SAMISCH, R. M. **Plum growing in the Jewish settlements of Palestine.** *Agric. Res. Sta., Rehovot Bull.* 50, 1948, pp. 82.

Except with soils that crack severely and areas to be prepared for irrigation there is little advantage in cultivation apart from weed destruction. Delay of spring ploughing is dangerous in unirrigated soils, but mid-winter ploughing results in erosion on hill orchards. Discs may be used in orchards that are not too stony, and spring-tooth, deep cultivators on heavy soil types where a ploughpan is likely to develop. Plough terracing is recommended.

(6) AFRICA

(*See also* Abs. Nos. 59, 132, 236, 239, 240, 244, 245)

[327] (62)631.416.2
GRACIE, D. S.; KHALIL, F. **The total and available phosphoric acid in Egyptian soils and the effect of superphosphate on the main agricultural crops.** *Egypt Tech. Sci. Serv. Chem. Sect. Bull.* 251, 1948, pp. 72.

The unbalanced nature of the consumption of artificial fertilizers in Egypt, much more N being used than P, is due to the Nile alluvium and the basin-land soils built up from it being well supplied with P_2O_5. The system of agriculture practised under irrigation ensures the return to the soil of considerable amounts of the P_2O_5 removed in crops. The gradual removal and redistribution of P_2O_5 in perennially irrigated soils is traced and the response to super. of the main agricultural crops grown on these soils is shown. Land still under the basin system is taken to represent the original condition of land now under perennial irrigation. In basin land the total P_2O_5 does not vary significantly with depth, whereas in perennial land it does decrease with depth, the decrease being at the expense of the "available" P; decrease in the "residual" P was slight. The drain from four million feddans of perennial land is calculated to be of the order of 37,000 tons of P_2O_5 a year, and the total loss to the soil to be much more. Ground mineral phosphates are ineffective.

Berseem has the largest requirement in P_2O_5 of the common agricultural crops. Beans and rice show a higher degree of response than cotton, wheat, barley or maize. Positive yield effects for super. are shown to be greater in cold than in warm

weather. Depressive effects from super. can occur where N supply and temperature combined afford exceptionally favourable conditions for rapid vegetative growth.

[328] (624)633.51-1.4
AFZAL, M. **Cotton growing in the Sudan.** *Indian Cott. Grow. Rev.* 2, 1948 (1-8). [Cott. Res. Lab., Lyallpur]

Subjects discussed include the soil of the Gezira Plain.

[329] (667)631.4
WEST AFRICAN CACAO RESEARCH INSTITUTE. **Soils of the Upper Densu Basin.** *W. Afric. Cacao Res. Inst. Rept. 1946-47*, 1948 (49-51).

The soils in the northern part of the basin have developed from biotite and hornblende granodiorites with coarse quartz crystals. The red, residual soils, which are excellent for cacao, are heavy, underlain by a gravel and ironstone concretion which is underlain by red, orange and pale yellow mottled clay which grades into the rotten parent rock. Brownish-yellow sandy soils developed over hill-wash that occupy the lower slopes of undulations and grey, waterlogged sands and clays occurring in river bottoms are poor cacao soils. In the south the soils have developed over granite or granodiorites containing coarse, granular quartz. The area has weathered to an undulating surface with steeper slopes than the area to the north. Mount Nyara, 1618 feet, is well watered and supports excellent cacao in the scanty earth between boulders, but the average annual rainfall for the area is 45 inches and approaches the minimum for successful cacao production. The soils are red, coarse sandy or gritty clays which occur in patches and are good cacao soils. Cacao planted on these soils has been almost entirely killed by virus disease and much of the area has degenerated into low bush or is heavily farmed and produces maize and cassava. Over much of the area cacao would probably have declined and died even if it had not been attacked by virus. Replanting of the greater part of this area cannot be considered an economic proposition owing to the unsatisfactory soils, destruction of trees and heavy cultivation of food.

The hills of the drainage divide to the north-west are steep and rocky and they and the lower-lying land at present support good cacao. The soils are heavy, somewhat greasy clays, red-brown on elevated sites, brown or yellow-brown on lower slopes and bluish-grey or grey and brown mottled in depressions. Their moisture relationships are good, but their inherent nutrient status is probably poor and cacao needs manuring for permanent production.

On the north east is the Voltaian scarp of coarse sandstones and clay shales. The soils are clayey sand and sandstone brash with no well-defined profile. They are well watered, but their nutrient status is probably low. On the east and south-east the drainage divide is formed of quartzites, sandstones and metamorphosed clay shales which form red, sandy soils. They are mostly covered with low bush and grass, and maize and cassava is grown. Their nutrient status and moisture regime are poor.

Over the lower-lying parts of the basin occur (1) heavy grey and brown mottled clays, usually swampy, which are one of the chief sugar-cane soils of the Gold Coast and are suitable for cacao and (2) sandy, natural levees forming the river banks; they are suitable only for coconut palms.

[330] (676)633.2.03-1.81
VAN RENSBURG, H. J. **Pasture management.** *E. Afric. Agric. J.* 14, 1948 (26-28). [Dept. Vet. Sci., Mpwapwa, T.T.]

The use of artificial fertilizers and compost on pastures in East Africa is still an untouched field. Farmyard manure is seldom used as it is better applied to intensively farmed land and gardens.

[331] (678)631.44 : 551.41
STOCKLEY, G. M. **The geology of the country around Mwanza Gulf.** *Tanganyika Dept. Lands and Mines, Short Paper* 29, 1947, pp. 20.

West of Mwanza Gulf the soil catena from the granite tors down the slope to the lake shore shows coarse sand with some felspar, then pale grey clay at 3800-4000 feet grading into *mbuga* on the flats. The coarse sand overlies the grey clay and spills down the slopes from the tors. The grey clay is probably of earlier formation than the *mbuga* and may be a lake deposit. The coarse sand grows mainly cassava crops and cotton is grown on the grey clay and the *mbuga*.

[332] (678)633.2.03 : 636.39
HORNBY, H. E.; VAN RENSBURG, H. J. **The place of goats in Tanganyika farming systems. I. In deciduous bushland formation.** *E. Afric. Agric. J.* 14, 1948 (94-98). [Vet. Lab., Mpwapwa]

On pastures obtained by clearing bushland, goats can be kept to advantage without causing pasture degeneration or soil erosion. They can be used to greatest advantage where a well established stand of grasses is being spoiled by increasing numbers of shrubs and woody herbs. Goats should not be browsed on climax bushland that has no ground cover as they will turn the area into grassland and reduce the valuable function of the bushland of protecting the soil. Goats should not be kept to check thicket re-growth.

[333] (678)635.25-1.81
SWYNNERTON, R. J. M. **Further note on onion experiments on Kilimanjaro.** *E. Afric. Agric. J.* 14, 1948 (23-25).

An application of 1-2 cwt./acre of $(NH_4)_2SO_4$ to flat beds of onions, spaced at 4½ inches between rows, within 30 days of transplanting increased yields. 2 applications 15 and 30 days after planting when rainfall is not heavy or continuous is probably preferable. Silicophosphate applied in 1947 gave no increase in yield.

[334] (68.01)63
SAUNDERS, A. R. **Some outstanding problems in agricultural science in the Union of South Africa.** *Roy. Soc. Emp. Sci. Conf. Rept. 1946*, 1, 1948 (364-369).

Fundamental soil problems are: the deficiency of available phosphate in soils; comparatively low organic-matter content together with extremely rapid oxidation of the organic matter in cultivated soils; a rapid deterioration in the structure of most soil types under cultivation. Soil-conservation problems include: erodibility of different types of soil and the factors affecting it; the influence of type of cover on run-off and erosion; the effect of method of cultivation and rotational practice on the amount of erosion from arable soils.

[335] (68.01)63 : 551.58
WHITMORE, J. S. **Agro-climatology. The scope of its application to S.A. agriculture.** *Farm. S. Africa* 23, 1948 (293-303). [Div. Agric. Educ. and Res.]

[336] (68.01)633.2/3-1.67
[LIEBENBERG, L. C. C.] **Grasses and legumes of proved worth. Factors in establishment of imported and indigenous varieties.** *Farm. Week. S. Africa* 76, Oct. 27, 1948 (105).

Discussion of the value of the different varieties, with special reference to varieties for irrigated land.

[337] (68.01)633.2.03
SCOTT, J. D. **Veld management in South Africa.** *S. Afric. Dept. Agric. Bull.* 278, 1947, pp. 40.

Resting periods during the growing season and mowing for controlling the accumulation of old grass are recommended. Veld burning should be done only where it is impossible to mow old grass and where encroaching undesirable plants must be controlled.

[338] (68.01)633.2.03-1.582
FARMERS' WEEKLY. **Soil-stability research in Transvaal. Ley system includes fertility-building fodder plants in cash-crop rotations.** *Farm. Week. S. Africa* 76, Oct. 20, 1948 (77-81).

[339] (68.01)633.51
HENNING, L. J. **Has cotton a place in our agriculture?** *Farm. S. Africa* 23, 1948 (570-576). [Coll. Agric., Potchefstroom]

If cotton is grown as part of a system of mixed farming in lowveld and middle-veld areas, with the object of keeping production level as high as possible, S. Africa should be able to produce cotton economically.

[340] (689.7)631.459 : 631.61
WEBB, H. W. T. **Storm drains, gully control and soil holding vegetation in soil conservation practice.** *Nyasaland Agric. Quart. J.* 7, 1948 (44-55).

[341] (689.7)631.81
GARDNER, B. **Manures and manuring for Nyasaland gardens.** *Nyasaland Agric. Quart. J.* 7, 1948 (26-30).

[342] (689.7)633.71-1.5
FORBES, A. P. S. **A note on *Nicotiana rustica* or nicotine tobacco.** *Nyasaland Agric. Quart. J.* 7, 1948 (35-39).

Nicotine sulphate extracted from nicotine tobacco (*Nicotiana rustica*) is effective against pests which DDT will not kill. The crop is grown in winter on rich alluvial areas bordering streams. On poor upland soils, applications of $(NH_4)_2SO_4$ increase yield and nicotine content; rainfall may have to be supplemented with irrigation. The nicotine content increases with increase in altitude.

(7) NORTH AND CENTRAL AMERICA

(*See also* Abs. Nos. 7, 93, 235, 238, 272)

[343] (7/8)633.18
EFFERSON, J. N. **Rice in the Americas.** *Rice J.* 50, 1947, No. 5 (12-16); No. 6 (11-14). Biol. Abs. 22 (1441).

Information on acreage, production, trade and cultivation methods, also per capita consumption in North, Central and South America and Asia.

[344] (72)633.63-1.81
DANEL, A. F. **Fertilizing sugarcane in Mexico.** *Sug. J.* 11, No 2, 1948 (5-6, 17-19). Agric. Bibl. 12 (43).

[345] (729)63
EVANS, G. **Post-war conditions in the British Caribbean colonies.** *Emp. Cott. Grow. Rev.* 25, 1948 (161-172).

[346] (729)633.61-1.4
TURNER, P. E. **The four main agricultural soil groups of Jamaica.** *J. Jamaican Assoc. Sug. Tech.* 11, 1948 (15-33). C.A. 42 (7907).

Cultural practices adapted to the physical natures of sugar-cane soils are described.

[347] (73)631.471
KELLOGG, C. E. **The detailed soil survey of the United States.** *C.R. Conf. Pédol. Méditerr. 1947*, 1948 (210-219).

The historical development of soil classification in the U.S. from the concept of soil as a weathered geological deposit to that of soil as a landscape is described. Detail and accuracy of soil mapping have greatly increased in the last two decades. The establishment of productivity ratings is cited as a great step forward in the practical interpretation of soil-survey data. Approximately one half of the arable land of the U.S. is covered by detailed soil surveys. These are now made on scales varying from about 1 : 20,000 to 1 : 48,000.

[348] (73)631.81 : 631.416
MEHRING, A. L. **Relation between plant nutrients removed from soils by harvesting crops and replaced in fertilizers and manures.** *Amer. Fert.* 109, No. 4, 1948 (26). [U.S.D.A., Beltsville, Md.]

More P is being added to soils in the U.S. as a whole than is being removed in harvested crops. Only about $\frac{2}{3}$ of the N and K removed is being replaced. In the eastern states more nutrients are being replaced as fertilizers than are being removed, but in most of the western states only a small fraction is being replaced. In the northern states more animal manure is being used than in the southern states.

[349] (74)551.48 : 551.577
MCALEER, J. B.; KNOX, C. E. **Annual rainfall and run off in New England.** *Trans. Amer. Geophys. Un.* 29, 1948 (903-908). [U.S. Geol. Surv., Boston, Mass.]

The relationship between average precipitation and average run off is discussed. Maps show average annual run off in the Connecticut Basin and vicinity.

[350] (74)631.416
GILLIGAN, G. M.; PHILLIPS, C. E. **Fertility status of Delaware soils.** *Del. Agric. Expt. Sta. Bull.* 269, 1947, pp. 20.

[351] (74)634-1.4 : 549
JEFFRIES, C. D.; ANTHONY, R. D. **Mineralogical analysis of some Pennsylvania orchard soils by means of the X-ray spectrometer.** *Proc. Amer. Soc. Hort. Sci.* 51, 1948 (271-286). C.A. 42 (9020). [St. Coll. Pa.]

Diffraction patterns for the very fine soil, silt and clay separates of three soil series are used as examples of the variability of the mineral composition of soils. Details of the weathering of some of the primary minerals of soils are pointed out. The presence of minerals of the kaolin group in the very fine sand and silt fractions and the lack of this mineral in the clay fractions was noticeable. The clay fractions in all the soils discussed consist essentially of hydrous mica with some primary minerals. Detailed study of the

mineral characteristics of soils in relation to fertilizer and moisture relationships should be valuable in planning agricultural undertakings of long duration, such as in orchards.

[352] (77)631.459 : 631.61
COMBS, L. R. **Soil conservation raises Midwest crop potentials.** *Amer. Fert.* 109, No. 5, 1948 (9-10, 24-28). [S.C.S. Milwaukee, Wis.]

[353] (78)631.459 : 631.61
SEAMANS, A. E. **Recommended practices for soil erosion control.** *Mont. Agric. Expt. Sta. Circ.* 190, 1948, pp. 7.

Summer fallow is essential to successful agriculture in the plains area, but land must be protected from wind erosion by stubble mulching and strip cropping. Grassed waterways should be established where there is running water.

(8) SOUTH AMERICA

(*See also* Abs. Nos. 235, 237, 238)

[354] (81)633.73-1.81
DAVIDSON, J. A. **[The problem of fertilizing coffee in Brazil.]** *Colheitas e Mercados* 4, Nos. 1/2, 1948 (27-31). Agric. Bibl. 12 (43). [Pt.]

[355] (82)633.51-1.4
PAULSEN, E. F. ET AL. **[Chaco cotton soils: Fertility.]** *Algodon* No. 131/132, 1946. Emp. Cott. Grow. Rev. 25 (223). [Sp.]

Physical, physico-chemical and chemical characteristics of cotton-growing soils of Chaco, Argentina are described and detailed results of analyses are given.

(9) OCEANIA

(*See also* Abs. Nos. 79, 173, 174, 274)

[356] (931)63
WALKER, C. **Farming in New Zealand. The South Auckland District.** *N.Z.J. Agric.* 77, 1948 (131-137, 247-254). [Ass. Fds. Super. Palmerston North]

The influence of climate on production in this essentially grassland country is discussed, as well as some of the problems involved in farming in South Auckland, such as reversion, erosion, weed problems and soil deficiencies of Cu and Co. Reversion is most apparent under high rainfall conditions and erosion is entirely caused by water action. Reversion cannot be overcome by firing and resowing alone; they must be associated with better subdivision, manuring, seeding and stocking with cattle.

[357] (931)631.459
RAESIDE, J. D.; BAUMGART, I. L. **Erosion on the downlands of Geraldine County. South Canterbury.** *N.Z. J. Sci. Tech.* 29A, 1947 (49-57). [Dept. Sci. Indust. Res.]

[358] (931)631.48 : 551.58
RAESIDE, J. D. **Some post-glacial climatic changes in Canterbury and their effect on soil formation.** *Trans. Roy. Soc. N.Z.* 77, 1948 (153-171). [Soil Bureau, Dept. Sci. Indust. Res.]

Anomalies between soils and present-day climates are discussed. Climates now prevailing over regions where pedalfers exist do not resemble climates associated with similar soils elsewhere; they resemble climates associated with pedocals. It is suggested that the soils in question have suffered several climatic fluctuations and spent part of their life under a wetter climate; that forests flourished on the downlands of Canterbury from the seventh to the thirteenth centuries when the temperature was at least 2°C higher than at present; and that soil profiles in this area should be regarded as complex and not in equilibrium with present climates.

[359] (931)633.321-1.81
WRAIGHT, J. D. **Seed production in New Zealand. Montgomery Red Clover.** *N.Z. J. Agric.* 77, 1948 (117-124). [Fd. Instr., Timaru]

Medium-quality clay down soils with cool, moisture-retaining sub-soils and a rainfall of 25 inches are the main soil and climate requirements of red clover. A ton of lime/acre should be applied when red clover is sown down with maintenance applications during the life of the pasture. Super. of about 2 cwt./acre in the spring is advisable. Phosphate will assist seed production if applied at sowing down and as top dressing on the established seed stand.

[360] (94)63
TRUMBLE, H. C. **Problems in agricultural science in Australia.** *Roy. Soc. Emp. Sci. Conf. Rept. 1946*, 1, 1948 (396-403).

The main problems discussed include: soil erosion; water relations of the main soil types; relationship of the paucity of micro-nutrients to the geochemistry of the basic-rock formations, climate and past land history; microbiological activities of the soil; organic compared with mineral fertilizers; role of organic acids in the soil; the problems of irrigable lands.

[361] (94)631.459 : 631.61
WEIR, G.; CLAYTON, E. S.; JACKA, C. K. **Soil conservation on the farm.** *N.S.W. Dept. Conserv. Soil Conserv. Serv.* 1948, pp. 18.

Individual erosion-control programmes with notes on the Government's advances scheme.

[362] (94)633.85
PENFOLD, A. R. **Oil-seed cultivation in Australia.** *J. Oil Colour. Chem. Assoc.* 30, 1947 (244-248).

Linseed, tung, soybean, castor, *Aleurites moluccana* and safflower are discussed as possible oil-bearing crops for Australia. Linseed, tung and soybeans are recommended.

[363] (943)631.4 : 581.5
MAUNDER, J. C. J. **The beef cattle industry in the far west.** *Queensland Agric. J.* 67, 1948 (11-22).

Contains information on the soils and vegetation of the channel country, the flood plains, the gravelly downs and the sandhill country of western Queensland (Georgina- and Diamantina-River country).

[364] (944)631.459
GRAHAM, F. **Soil erosion in Eastern Riverina.** *J. Soil Conserv. Serv. N.S.W.* 4, 1948 (135-138).

[365] (944)635.53-1.81-1.67
PURDUE, C. E. **Celery production on the Murrumbidgee Irrigation Area. Investigational work at Leeton Experiment Farm.** *Agric. Gaz. N.S.W.* 59, 1948 (469-470).

Celery requires large amounts of fertilizer and 5 cwt. of a mixture of 3 parts super. and one part $(NH_4)_2SO_4$ were drilled into hills spaced 3 feet apart. For maximum production of celery $(NH_4)_2SO_4$ should be applied as a side dressing during the period of most vigorous growth. A side dressing of equal parts of super. and $(NH_4)_2SO_4$ at the rate of 2½ cwt./acre was applied 5 weeks after transplanting and later 2 dressings of $(NH_4)_2SO_4$ at 2 cwt./acre were given, the first at 2 months after transplanting and the second three weeks later. Intensive watering was carried out during the latter part of the growing period at 5-day intervals on heavy soils. On light soils 3-day intervals would probably be necessary.

[366] (945)634-1.5
WALSH, J. C. **Soil fertility in the orchard.** *J. Dept. Agric. Victoria* 46, 1948 (345-349).

Most Victorian orchard soils are deficient in organic matter and in some minerals. Good results have been obtained with $(NH_4)_2SO_4$ for pears, and N fertilizers for peach and citrus trees. Experiments have also been conducted with systems of "no cultivation", such as keeping apple orchards under sod, with the use of oil sprays to kill surface growth and with a U.S. method of maintaining a permanent straw mulch to a depth of 8 inches. "Trashy cultivation" or leaving green-crop residue on the surface is also mentioned.

[367] (945)634.334
MCALPIN, D. M.; ROLFE, W. A. **Lemon growing in Victoria.** *Victoria J. Dept. Agric.* 46, 1948 (433-441).

Lemons require deep, well-drained sandy soils with an absence of limestone rubble down to a depth of 4-5 feet. Drainage in lemon groves aims at the prevention of salt damage through seepage or overwatering in the lighter-textured northern Victorian soils. In all Victorian soils the main aim is to supply N and organic matter. In certain districts there are also Mg and Zn deficiencies and B, Mn and NaCl toxicity. 1-2 cwt./acre of super. is sufficient for lemon trees in all districts. Lime is used at the rate of 1-2 tons/acre to reduce soil acidity, to improve soil texture and to assist soil bacterial action, N availability and the growth of leguminous cover crops, but not to supply Ca, as there is no Ca deficiency in Victorian lemon groves. The art of irrigation to avoid water tables and associated salt and waterlogging problems is to wet the soil only to the depth of the feeding roots, which is no more than 3 feet 6 inches in sandy soils and less in heavy types. The irrigation methods include sprinkler, furrow and flood or basin systems. The sprinkler systems are more effective than other systems in ensuring even distribution of water.

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SOILS AND FERTILIZERS

Vol. XII 1949 No. 2

PEDOLOGISTS IN UNIFORM

Many readers will have noticed, in the lay and scientific press, references to a process going on in the Soviet Union to bring scientific thought into line with certain principles originally put forward by T. D. Lysenko in connexion with genetics, and subsequently extended to embrace many other branches of science and elevated almost to the status of articles of faith. That soil science has now been included in this embrace is indicated in an article in *Pedology* by the chief editor, L. I. Prasolov, that appeared in No. 9 of that journal, 1948, under the title "Tasks of the Journal *Pedology* in the light of the Resolutions of the Session of the All Union Lenin Academy of Agricultural Science and the Presidium of the Academy of Sciences, U.S.S.R." A translation of this article follows.

The resolutions of the session of the Lenin Academy of Agricultural Science following Academician T. D. Lysenko's paper "On the State of Biological Science," and also the resolution of the Presidium of the Academy of Sciences of the U.S.S.R. on the state and tasks of biological science in the institutes and institutions of the Academy of Sciences, have great historical significance. Lysenko's paper and the whole trend of the discussion completely exposed the reactionary basis of the ideological Weissmann (Mendel-Morgan) direction in biology and demonstrated the triumph of Michurin's doctrine developed in the advanced positions of dialectical materialism.

The results of the session of the Lenin Academy of Agricultural Science have a direct bearing on soil science.

Soil science is in many of its branches inextricably involved with biology, and should therefore set and solve the problem of directing the conditions of development not only of crop plants, but also of forests, pastures and meadows towards a determined goal by means of the continuous enhancement of soil fertility. This problem was set and successfully solved by the creators of modern soil science, the great Russian scientists V. V. Dokuchaev, P. A. Kostychev, V. R. Williams, K. K. Gedroits and D. N. Prianishnikov.

Soil science as a particular and independent science created by Russian scientists has shown itself in all its fundamental propositions as the negation of the principles and methods of foreign soil science, which is agro-chemical and agro-geological. Russian, Dokuchaev soil science has developed particularly well in both ideas and methods during the years of Soviet rule.

Unfortunately not all soil scientists understand clearly that Dokuchaev created a new science of the soil, and that, just because of this, Russian genetic soil science has always successfully resisted the foreign agro-geological and agricultural-chemical trend.

V. R. Williams created an epoch in soil science by enriching and developing Dokuchaev's doctrine of soil formation. By his progressive views he created a harmonious agricultural system which makes it possible continuously to increase the fertility of the soil and efficiently to regulate the conditions of plant growth. Thus, Williams's classical studies are a very important element in the advanced doctrine of I. V. Michurin and T. D. Lysenko about the methods and means of altering the nature of crop plants and animals.

Only under the conditions of a socialist regime are all the necessary premisses created for a wide application and development of the scientific ideas of Dokuchaev and Williams. Many of Dokuchaev's and Williams's scientific propositions have influenced foreign science, but owing to reactionary social-economic causes they could not attain full development in foreign countries. Moreover, we know of many

attempts of foreign scientists to diminish and deprecate the great scientific attainments of Dokuchaev and Williams in the realm of soil science.

Among the immense scientific services of Williams special mention must be made of his doctrine of the structure and the water and nutritional regimes of the soil that is the basis of Soviet agronomy. The significance of vegetation and micro-organisms for the formation, evolution and fertility of the soil was most fully and convincingly developed by Williams. His meadow theory, particularly his doctrine of the development of water meadows, provided a firm basis for meadow science and technical measures in connexion with the improvement and utilization of meadows. For conditions of irrigation husbandry in the U.S.S.R., the grass-rotation system of agriculture and the whole complex of Dokuchaev-Williams agrotechnical measures provide a method for the prevention and control of soil salinization.

This does not represent the whole of Williams's fruitful and varied scientific activity, but it shows clearly the enormous importance of his work in the development of socialist science and socialist agriculture in the U.S.S.R.

But the great scientific and practical significance of the Dokuchaev-Williams doctrine was neither understood nor appreciated by some soil scientists.

Misunderstanding and deprecation of the nature and significance of the Dokuchaev-Williams doctrine have manifested themselves in various ways. For instance, certain soil scientists considered that the practical problems of agriculture should be dealt with by agronomic soil science, while the so-called theoretical soil science should only deal with the general problems of soil formation without concerning itself with concrete problems of increasing the fertility of the soil.

Such an artificial division of theory and practice is, of course, entirely mistaken. It contradicts the Lenin-Stalin interpretation of the relation of theory to practice and does not correspond to the course followed by Dokuchaev and Williams.

Nevertheless, such an incorrect attitude to practical problems has even been evident in the contents of certain papers published in *Pedology*. The editors did not take timely measures to refute such an entirely false outlook. They did not insist on authors formulating practical conclusions and suggestions from the new scientific results obtained in their investigations, and thus have not removed all traces of "academism" and "theorizing" that have remained in the journal up to the present time.

Many articles devoted to leading Russian scientists have been published in the journal: to Dokuchaev, to Kostychev, to Williams, to Gedroits, to Prianishnikov, and to Mendeleev, but these articles were mostly concerned with jubilees or had a historical character. Articles on the further development of the scientific ideas and methods of Kostychev and Williams have been almost entirely lacking.

Many works on soil science, including even those which contained false viewpoints, were not subjected to critical examination.

The position has been very bad in connexion with the critical examination of the works of non-Russian scientists, particularly of those who have developed a dangerous pseudo-scientific outlook or whose aim has been to distort the role of the great Russian scientists in the development of soil science. During the last few years only a few such reviews have been published (e.g., on Jenny's book), but the books of Vageler, Mattson and Wiegner were evaluated in an entirely unsuitable manner, and some of them were even published here without the necessary critical observations.

Thus, the ideological education of soil scientists by means of reviews, criticisms and other similar material has been almost entirely ignored in the journal. The editors have fallen down on their job, as have also the soil scientists of the Dokuchaev Soil Institute, of Moscow University, of the chair of pedology of the Timiriazev Academy and others who have not faced up to these problems.

However, it is not sufficient to acknowledge mistakes. Measures must be taken for their

rapid elimination and for the reconstruction of the entire scientific work of the soil scientists of our institutes and, at the same time, of the work of the journal *Pedology*. It is imperative that scientific investigation should be directed towards the further development of the Dokuchaev-Williams complex and its application to agriculture. Scientific investigations must be organically related to the demands of the national economy. On the basis of the Dokuchaev-Williams doctrine measures must be evolved for dealing with drought, and for the prevention and control of soil erosion; salinization and swamping of soils must be liquidated; the effectiveness of fertilizers must be increased by combining Prianishnikov's doctrine with that of Dokuchaev and Williams. In a word, the problems of increased soil fertility must be solved from all sides.

In its invocation to the great leader and teacher, comrade J. V. Stalin, the Presidium of the Academy of Sciences of the U.S.S.R. wrote:

"The Academy of Sciences will take all necessary measures to ensure the fullest development of the Michurin biological science in biological institutes, journals and publications . . . .

"We promise you, comrade Stalin, to take a leading position in the fight against ideological reactionary doctrines, to clear the way for the unimpeded development of progressive Soviet science in the name of the great aims of our people, in the name of the victory of communism."

The editors of *Pedology* must fulfil this promise. *Pedology* must be converted into the fighting organ of the entire collective of Soviet soil scientists, directing our science along the way of service to the people and exposing all deviations from this course. Only in this way can Soviet soil science successfully carry out the great tasks placed before Soviet science by the party and the government.

SOIL PHYSICS

(*Soil Physics. By L. D. Baver. John Wiley & Sons, New York: Chapman & Hall, London. Second Edition,* 1948. Pp. xi + 398. *Price* 28s. 6d.)

The call for a new edition of Dr. Baver's "Soil Physics" shows that it has filled a want. The first edition was written after the author had delivered nine courses of lectures on the subject to senior undergraduates and graduate students studying agronomy. The second edition follows the same general lines as the first. The main additions relate to electron microscopy of soil particles, soil-moisture relationships, soil structure and aeration, ploughing and the erosive action of raindrops.

A noteworthy feature is the wide range of literature cited and summarized, and the due recognition that is given to early investigators. The author neatly contrives in many instances to let his authorities speak for themselves. A good general impression of much that has been achieved in the endeavour to apply physics to soil problems can be gained by reading this book.

A close scrutiny of the text, however, reveals some defects. Most of these are merely slips that could have been rectified in the course of revision. At some points the text could seriously mislead an earnest student who hangs on the author's words.

For instance, on p. 305 we read "If the surface of the soil becomes cooler than the subsurface layers during the night there will be a movement of heat toward the surface and into the atmosphere, that is, if the atmosphere is cooler than the soil." What is to prevent our earnest student from inferring from this sentence that heat cannot be lost from the soil surface when it is at a higher temperature than the air? True it cannot, in this case, be lost by conduction, but it could be lost by radiation. The cooling of plants and soil by radiation on clear still nights is a phenomenon of great agronomic importance in view of the wide-

spread frost damage it can cause. Neglect of this aspect is probably a consequence of attempting, for teaching purposes, to separate soil physics from meteorology.

Although the author constantly speaks of soil porosity, he passes over the measurement of volume weight in a single sentence on p. 165: "The apparent specific gravity or volume weight is measured by weighing a given volume of soil in its natural structure." There is no mention of how the "given volume" is obtained, and it would surely be wise to make it clear that the weight required is that of oven-dry soil.

Probably the main source of weakness is that the book is not designed to assist the reader to make his own physical measurements on soils.

R. K. SCHOFIELD

A TEXT BOOK OF AGRONOMY

(*The Production of Field Crops. By T. B. Hutcheson, T. K. Wolfe and M. S. Kipps. McGraw-Hill, New York. Third Edition,* 1948. Pp. 430. *Price* \$4.50.)

This is a new third edition of a standard text-book first published in 1924. Changes in the development of the field-crops industry since the last revision of the book in 1936 including more thorough mechanization of farming are described, and old material has been revised or omitted.

The first part of the book is devoted to discussions of the fundamentals and principles underlying the production of all crops and common practices such as seed-bed preparation, seeding methods, the use of fertilizers and lime, tillage, pasture and meadow management, weeds and crop rotation. The proper use of fertilizers is stressed, and yields from increased application of fertilizer to a few crops from widely-scattered areas in the United States are illustrated graphically. Methods of fertilizer placement are compared. Soil type, weather conditions, the type of crop grown, the productivity of the soil and the length of the growing season are discussed, and their influence on the profits that may be obtained from the use of fertilizers and systems of fertilizing are compared.

The preparation of a good seed bed and the importance of the time of ploughing are stressed, and methods of seeding are compared. Deep tilling, subsoiling and dynamiting are not advised for ordinary crops. The relationship of soil productivity to the rate of seeding is discussed from results obtained in Ohio, Virginia and Tennessee. New material has been added on seed-bed preparation including stubble-mulch farming. Results obtained at Agricultural Experiment Stations are used to illustrate the effects of tillage on the killing of weeds, on the conservation and storing of moisture and on the aeration of the soil.

In dealing with problems of pasture and meadow management, 22 grasses and 15 legumes are considered for permanent pasture and for each the climatic adaptation, degree of palatability, season for grazing, time and rate of seeding, soil adaptation and type of topography and land on which it can be grown are tabulated with remarks on the type of turf resulting.

Losses due to weeds and advantages of weeds in adding organic matter to the soil are discussed. New material on weed control has been added.

Crop rotation is considered for the control of pests, the maintenance of organic matter, nitrogen supply, economy of labour and soil protection. Rotation alone is not sufficient to maintain productivity, as the larger crop yields obtained from rotations result in a greater total removal of plant nutrients than from a single crop. The essentials of a good rotation are that the area of each crop should be nearly the same each year and that the rotation should provide roughage and

pasture for animals and one tilled crop for the elimination of weeds. Examples of good rotations are given for widely different areas of the United States.

The second section comprises more than half the book and discusses individual crops, their world production and production in the United States, their origin and history, varieties and uses, cultivation and harvesting. Insect pests and diseases are described and control measures are discussed.

M.K.M.

THE LAWS OF YIELD

(*Die Ertragsgesetze. Vorträge und Schriften der Deutschen Akademie der Wissenschaften zu Berlin, Heft* 31. *By E. A. Mitscherlich. Akademie-Verlag Berlin,* 1948. Pp. 42. *Price* DM2.75.)

The author discusses the mathematical laws governing plant life and therefore plant yields, the "Growth-Factor Effect Law" and the Law of Plant Growth. While the former shows how the magnitude of the yield is determined simultaneously by the growth factors both individually and as a whole, the latter shows how the yield increases during the vegetative period.

In connexion with the Effect Law the author points out the variously large effects of the plant nutrients in particular, and shows then the effect of over-fertilizing with nitrogen and also the possibility of determining, by means of the law, the nutrient content of the soil, and thus of calculating the fertilizer application to be made to a soil. The law is, however, also applicable to all the growth factors, including light, heat, water, depth of cultivation, spacing, etc. The "effect value" (*Wirkungswert*) of a growth factor is constant and independent of plant species, climate and soil, except when the different growth factors influence each other, as, for example, with the physical growth factors which alone make possible the uptake of the chemical growth factors.

The Law of Plant Growth governs the water requirement and thus the operation of supplying water to the plant during the vegetative period.

SUMMARY OF REPORTS

Reports received include: *Algeria*, Comptes rendus de l'expérimentation fruitière et de l'activité du Service de l'Aboriculture en Algérie 1945-46; *Amani*, East African Agricultural Research Institute Report 1947; *Australia*, Report of the Department of Agriculture and Stock, Queensland 1947-48; Queensland Bureau of Sugar Experiment Stations, Report of the Director 1948; Research and Scholarship in the University of Sidney 1944-45; Victoria Soil Conservation Board Report 1947-48; Mallee Research Station, Victoria, Experimental Work and Results, (in *J. Dept. Agric. Victoria,* 46, 1948) 1947-48; *Canada*, Department of Agriculture, District Experiment Substation, Fort William and Illustration Stations at Dryden and Emo, Ontario 1937-47; Ontario Department of Agriculture, Report of the Minister of Agriculture 1947-48; *Colonial Office* Annual Reports 1947 for Brunei, Cyprus, Dominica, Falkland Islands, North Borneo, Northern Rhodesia, Nyasaland, Sierra Leone and Tonga; *Congo*, l'Institut National pour l'Étude Agronomique du Congo Belge Rapport 1947; East Malling Research Station Report 1947; *Fiji* Department of Agriculture Report 1947; *Gold Coast* Department of Agriculture Report 1947-48; *India*, Central India Institute of Plant Industry, Indore, Report 1946-47; *New Zealand*, Canterbury Agricultural College Report 1947-48; *Nyasaland*, Department of Agriculture Report 1946; *Puerto Rico*, Federal Experi-

ment Station Report 1947 ; *Southern Rhodesia,* Programme and Progress Report of the Pasture Research Chemist 1947 (in *Rhod. Agric. J.* 45, 1948) ; Programme and Progress Report of the Central Veld and Pasture Station for Matabeleland 1947 (in *Rhod. Agric. J.* 45, 1948); *Scotland,* Edinburgh and East of Scotland College of Agriculture Report 1946-47 ; Transactions of the Highland and Agricultural Society of Scotland 1948 ; *Switzerland,* Stations Fédérales d'essais Viticoles, Arboricoles et de Chimie Agricole, à Lausanne et à Pully, Rapport d'activité 1947 ; *Trinidad and Tobago,* Report of the Director of Agriculture 1947 ; British *West Indies* Sugar Association Reports on Research Work 1947 ; *United States Experiment Stations.* Rhodes Island 1946-47.

Algeria.—Studies on the influence of lime content of the soil on fruit quality. Irrigation and salt content of soils.

Amani.—Micropedological investigations on structure of soil crumbs (see Abstract No. 449). Problems of drought resistance and water-requirements of local maize and sorghums.

Australia.—*Queensland Department of Agriculture and Stock.*—Establishment of Soil Conservation Section within the Division of Plant Industry and setting up of farm demonstration projects. Fertilizer and irrigation trials with potatoes ; deficiency of N and K in maize-peanut rotations ; fertilizers for maize ; trials with silico-phosphate and serpentine super. on peanuts ; K deficiency in some lucerne-growing areas ; response of lucerne to super. is probably due to S in the super. Rotations with grasses and legumes for restoration of worn-out tobacco land. Trials to correlate lime requirement with acidity measurements on sugar-cane soils ; subsoil pH figures may play an important part in an approach to the problem. Minor-element trials and trials on balance between N and K in sugar-cane soils. Trials with benzene hexachloride for killing white grubs in pastures and with benzene hexachloride-fertilizer mixture for wireworm control. Trials with DD for nematode control in tobacco. Work on the water-dispersion and sieving method for assessing changes in soil structure brought about by irrigation and cultivation.

Queensland Bureau of Sugar Experiment Stations.—Experiments on liming of soils. Minor-element trials with Cu and Zn and tests with the correct balance between N and K applications. Gammexane for white grub destruction and wireworm control. Effects of K fertilizers on maturity. Trash and green-manure experiments on rotation crops.

University of Sidney.—Factors affecting the ascorbic-acid content of tomatoes grown in glasshouses and in the field. Measurement of the phosphate-fixing capacity of soils. Root-nodule bacteria.

Victoria Soil Conservation Board.— Stabilizing sand dunes in the Mallee by application of super. and sowing of cereal rye. Re-afforestation of catchments.

Mallee Research Station, Victoria.—Manurial trials with oats. Wheat rotation. Fallow-ploughing trials. Yield of wheat following different cover crops. Sanddrift control on cultivated and non-cultivated land.

Canada.—*Fort William, Dryden and Emo.*—Crop rotations and weed control. Maintenance of soil fertility by crop rotation and use of chemical fertilizers, manure and lime. Fertilizers for potatoes, cereals, hay and pastures.

Ontario Department of Agriculture.—Ontario Agricultural College.—N top-dressing for winter wheat and methods of application. N side-dressing for canning corn. Fertilizers in relation to lodging of spring grain. Fertilizers for potatoes. Ratio of K to Mg in fertilizers for canning tomatoes. Micronized (very finely ground) rock phosphate compared with super. Trials with Cu, Mn, Fe, Zn and B fertilizers for carrots. Comparison of the effect of mineral fertilizers with soil-management practices on the improvement of legume seedlings in rotations. Influence of K/Mg ratio on growth, yield and composition of lucerne grown on alkaline calcareous soils. Mn availability in soils.

Congo.—Fertilizers for oil palms and citrus ; rotations. Relationship between soil type and natural vegetation. Soil microflora. Intensive cultivation of bananas with organic

fertilizers and composts; mulches and cover crops for bananas. Experiments combining shade and application of fertilizers to sisal; shade and cultivation. Intercropping of bananas with sisal, and cotton with groundnuts. Rotations with cotton, maize, cassava and fallow. P fertilizers for maize.

Fiji.—Conservation of farmyard manure. Soil conservation by contour and rotational cropping on a model farm. Proposed reconnaissance soil survey.

Gold Coast.—Fertilizers for cacao. Wilt disease of coconuts aggravated by low water table following dry seasons, on poor soils to which no compost or manure was added. Investigations on the possibility of die-back in limes being due to deficiency of a major or trace element or to soil micro-organisms.

Northern Territories.—Introduction of mixed-farming methods. Control of grass burning. Planning of anti-erosion methods and development of agriculture, forestry and water supplies. Yields of groundnuts on the flat and on ridges; soil wash and erosion. Manuring of grassland and rotational grazing.

Ashanti.—Rotational cropping. Soil survey in northern Ashanti to assess suitability of the region for large-scale mechanized groundnut cultivation.

Gold Coast Colony.—Manures for rice. Fertilizer and rotational trials with soybeans, chillies, sunflowers and vegetables.

Central India Institute of Plant Industry.—Trials with $(NH_4)_2SO_4$, groundnut cake and P fertilizers on cotton. P fertilizers for leguminous crops preceding cotton. Soaking of seed of cotton, wheat, gram and linseed in nutrient solutions of mono-, di- and tri-potassium phosphates before sowing.

Nyasaland.—*Tung Experimental Station, Cholo.*—Trials on the intercropping with soybeans removed at harvest, intercropping with a rotation of food crops, maize with trash buried after harvest, green manure dug in annually, permanent cover crop, trees circle weeded and mulched. Manuring experiments with tung-press cake, cotton seed, farmyard manure and complete fertilizer.

Port Herald and Makanga Stations.—Trials on flat *versus* ridge planting of native-grown crops on light sandy soils of the Lower River. Manurial experiments with compost, burying plant refuse and burning plant refuse. Mulching experiments on maize.

New Zealand.—*Canterbury Agricultural College.*—Soil microbiology; antibiotic activity of *Actinomyces* and soil conditions favouring their growth in soil; growth relationship in the soil between *Actinomyces* and *Rhizoctonia*; presence of *Rhizoctonia* facilitated the spread of *Actinomyces* through the soil. Steam sterilization and treatment with chloropicrin. Shallow- and deep-ploughing programmes with and without inversion in the furrow. Frequency of sampling required to give reliable determinations of the physical and chemical soil properties. Survey of South Island agricultural limestones. Crop responses to soil acidity. Cu-deficiency studies.

Puerto Rico.—Fertilizers for derris; mulching of derris gave good rooting and higher yield of rotenone. Determination of the value of soil fumigation prior to transplanting cinchona seedlings. Mulching was detrimental to young cinchona. Investigation of the soil-moisture level most suitable for cinchona. Trials with kudzu in soils of different acidity; mineral deficiencies in kudzu; chlorosis in kudzu associated with low K/Ca ratio. Fertilizers for bamboo. Mulches for vanilla. Comparison of composts, manures and fertilizers for Chinese ginger. Effects of fertilized leguminous cover crops on yields of sweet potatoes and maize. Effect of sugarcane trash on hillsides on the reduction of erosion.

Southern Rhodesia.—*Pasture Research.*—Survey of Marandellas vlei soils. Effect of indigenous trees on the N and organic-matter content of soil; comparison of soils in stumped and unstumped paddocks. Effect of fertilizers on established vlei pasture.

Central Veld and Pasture Station for Matabeleland.—Revegetation of denuded and eroded areas by covering bare ground with a mulch of felled thorn trees and brushwood; seeding has proved unnecessary and ground cover is established in a short time. Experi-

ments on runoff and erosion, efficiency of rainfall, correlation of soil moisture with rainfall and comparative value of various types of plant cover in conserving water supplies. Conservation of streambanks, vleis and sponges; succession studies; measurement of water-table depth.

Scotland.—*Edinburgh and East of Scotland College of Agriculture.*—Cultivations for autumn-sown wheat. Long-range rotation experiment on 6-course rotation. Improvement of hill grassland by means of top dressing and controlled grazing without ploughing. Manuring of cocksfoot for seed production. Experiments on soil pH and liming of sugarbeet; applications of K and Na to sugarbeet. Residual value of P fertilizers on barley after roots, and oats after potatoes. Test of reaction between different liming materials and two very acid soils, one mineral and one peat.

Switzerland.—*Lausanne and Pully.*—Soil disinfection by electric heating. Persistence of herbicides in soil. Symbiosis of legumes. Fertilizers for vines and fruit trees. Fertilizers for pastures, and for oats on reclaimed peat soils.

Trinidad and Tobago.—Effect of mulch and fertilizers for cacao. Comparison of $(NH_4)_2SO_4$ and NH_4NO_3 for sugarcane. Effect of season of application of pen manure. Manurial trials with citrus; $(NH_4)_2SO_4$ while increasing yield increased dieback, which can be prevented to some extent by using Mg-containing fertilizers in conjunction with sprays containing Zn and Mn.

British West Indies Sugar Association.—Classification of sugar-cane soils and their distribution in the West Indies. Poor response to manures until cultivation and drainage is improved. Long-term effects of $(NH_4)_2SO_4$. Comparison of $(NH_4)_2SO_4$ and nitrates. Effect of size of dressing of N on gain from P and of P on gain from K. Manurial trials in relation to soil type in Antigua. Use of pen manure, mulching, molasses and green manure. Sudan grass, tomatoes and maize as indicator plants for manurial requirements of sugar-cane. Irrigation control in Jamaica.

United States Experiment Stations

Rhode Island.—Fertilizer placement for maize. Response of ladino and orchard-grass mixture to N and pH of the soil. Comparison of KCl and K_2SO_4, and of different P fertilizers. Residual effect of P. N applications for rye cover crops. Soft rot of potatoes and relationship to temperature, soil moisture and fertility and to application of N fertilizers. Weed control in lawns by soil sterilization and by application of cyanamide. Application of N to rye cover crop before ploughing under.

ABSTRACT SECTION

NOTE.—A capital letter in square brackets following the reference denotes the language in which the paper is written. A small letter denotes a summary in another language, e.g. [G.e.]—German, with English summary. English [E.] is only indicated for papers published in journals usually written in foreign languages.

Original (untranslated) titles of papers are only given where the Latin script is used.

Where more than one reference is given, the first is to the original paper, the others to notices in abstract journals. A key to the abbreviations used in the references is contained in the Bureau's *Bibliography of Soil Science, Fertilizers and General Agronomy.*

631.3 AGRICULTURAL EQUIPMENT

(*See also* Abs. No. 658)

[368] 631.333

CAMUGLIA, G. **A new type of fertilizer spreader.** *Proc. Queensland Soc. Sug. Cane Tech.* 1947 (209-210). Hort. Abs. 18 (222).

A machine for distributing $(NH_4)_2SO_4$ is described. It is narrow enough to pass between rows, light in draught and able to break lumps of fertilizer.

[369] 631.333

NATIONAL AGRICULTURAL ADVISORY SERVICE. **Fertilizer distributors.** *N.A.A.S. Farm Mach. Leafl.* 11, 1948, pp. 4.

Reciprocating-plate, rotating-plate-and-flicker, roller-feed, worm-feed, conveyor-and-brush, endless-chain, star-wheel, and spinning-disc distributor mechanisms are described.

[370] 631.347.24

VEIHMEYER, F. J. **Sprinkling for irrigation.** *Calif. Agric. Expt. Sta. Circ.* 388, 1948, pp. 18.

Types of sprinklers and stationary, semi-portable and portable systems are described and advantages and limitations of sprinklers are discussed.

631.4 SOILS

[371] 631.4 (083.72)

SMITH, R. **Nomenclature and soil science.** *J. Aust. Inst. Agric. Sci.* 14, 1948 (104-106). [C.S.I.R., Univ. W. Aust.]

The shaping of a satisfactory system of nomenclature is suggested as a pressing need of pedology.

[372] 631.4 : 549.1 : 537.531

JEFFRIES, C. D. **The use of the X-ray spectrometer in the determination of the essential minerals in soils.** *Proc. Soil Sci. Soc. Amer. 1947,* 12, 1948 (135-140). [St. Coll., Pa.]

The principle of the design and the essential features of the apparatus, which provides a record on calibrated paper of the various X-ray reflections of crystalline compounds are briefly described. The diffraction patterns of standard minerals are presented, by the use of which the predominating minerals of the very-fine-sand, silt and clay fractions of soils can be seen at a glance. The study of d values will also reveal lines of minerals occurring in minor quantities. Fe was removed by the author's nascent-H method (see *Soils and Fert.* XI [447]) before separation of the fractions. Patterns for the separates of 3 series from Pennsylvania illustrate the variability of the mineral composition of different soils. The characteristics of the very-fine-sand and silt fractions of the same soil were about the same, but under certain conditions kaolin appeared as a decomposition product, although lacking in the clay fraction, which in all the soils consisted chiefly of some primary minerals and hydrous mica. This suggests the formation of intermediate clay minerals during weathering that may exist as coatings on primary-mineral particles. Knowing where such conditions exist would be of interest in studying soil characteristics such as fixation and release of nutrients. The data are suggested as a valuable aid in soil survey and classification because of the ease and rapidity with which they can be obtained and interpreted.

[373] 631.4 : 581.5
KILLIAN, C. Conditions édaphiques chez les plantes des pâturages steppiques algériens. **[Edaphic conditions of the plants of the Algerian steppe pastures.]** *C.R. Conf. Pédol. Méditerr. 1947*, 1948 (451-454). [F.]

Close study of the apparently monotonous flora of the high Algerian plateaux shows that it is fairly complex, and that the floral composition depends to a considerable extent on micro-edaphic conditions. Gypsum and Mg salts in the soil play a selective role in the distribution of plant species; the Cl content of the soil does not have much influence. Soil texture has a pronounced influence on the vegetation.

631.41 SOIL CHEMISTRY

(*See also* Abs. Nos. 425, 493, 608, 707)

[374] 631.411.2 : 631.811
BROWN, D. A.; ALBRECHT, W. A. **Plant nutrition and the hydrogen ion: VI. Calcium carbonate, a disturbing fertility factor in soils.** *Proc. Soil Sci. Soc. Amer. 1947*, 12, 1948 (342-247). [Missouri Agric. Expt. Sta., Columbia]

Studies were made of the effect of free $CaCO_3$ on the nutrient uptake of soybeans from the highly calcareous Gila Adobe clay (whose colloid complex was 81% Ca-saturated) when mixed with increasing amounts of acid subsoil clay to reduce progressively the total Ca and free $CaCO_3$ contents of the mixtures. The increasing admixture of the acid clay caused increases in dry matter and in N, P, K, Ca and Fe uptake by the plants, although with each increase in the acid clay the total nutrients available in the mixture as well as the exchange capacity of the mixture were greatly reduced. As the free $CaCO_3$ was neutralized the degree of Ca saturation of the mixture increased to 98%. The data suggest that even large fertilizer applications of P, N and certain minor elements may be very inefficiently taken up by plant roots in the presence of the excessive Ca.

[375] 631.411.4 : 546.56
CUNNINGHAM, I. J. **Peat lands need copper fertilizers.** *N.Z. J. Agric.* 77, 1948 (340).

Practically all reclaimed peat land in New Zealand is deficient in Cu. The best way to supply Cu is to top-dress the whole farm each year with 5 lb. of bluestone per acre. Where super. is used, a copperized super. containing 56 lb. of bluestone per ton can be applied. 2 cwt. of this super. contains a suitable amount of Cu for one acre.

[376] 631.411.4 : 631.81
TIND-CHRISTENSEN, C. J. Fortsatte Forsøg med Kvaelstof, Fosforsyre og Kali uden og med Kalktilførsel til Marskjord. 1924-1947. **[Continued experiments with nitrogen, phosphate and potash with and without addition of lime to marsh soils. 1924-1927.]** *Tidsskr. Planteavl* 52, 1948 (189-222). [Da.]

In heavy marsh soils with pH 6 or less, low P and high K contents, P and N fertilizers gave good responses, K alone very little response. Liming with 20 tons of $CaCO_3$/ha. raised the pH to 7 and increased the available-P content (P number). In general, after liming P and K responses were smaller, and N response was as large as, or larger than, before liming.

[377] 631.413.1 : 535.21
MARTINEC, T. Vliv světla na regulativnost pH vysychající půdy. **[Effect of light on the regulability of pH of soils during drying.]** *Pub. Fac. Sci. Univ. Masaryk* 279, 1946 (3-25). B.A. BIII, 1948 (350). [Cz.e.]

The buffering capacity of aqueous extracts of acid and alkaline soils prepared after partial drying in sunlight, ultra-violet light and in the dark rises in that order. The effect is ascribed to the destructive action of irradiation on organic soil constituents. Ploughing of mountain soils should be avoided because of the irreversible effects on soil structure, and hence on buffering capacity, of the more intense activity prevailing at high altitudes.

[378] 631.414.2 : 549
HÉNIN, S. La formation des argiles et la pédologie. **[Clay formation and pedology.]** *C.R. Conf. Pédol. Méditerr. 1947*, 1948 (97-108). [F.] [Versailles]

A review of experiments on the synthesis and alteration of clay minerals. It is suggested that there are two main types of "phyllitic" minerals, the 7-Å type (kaolinite, antigorite, halloysite, etc.) and the 10-14-Å type (mica, montmorillonite, vermiculite,

chlorite, etc.), those of the second type being largely interconvertible without complete breakdown. Alteration of rock minerals may be a surface phenomenon (epigenesis). At present, it is not possible to ascribe a particular clay mineral to each soil type, and soil types may have to be subdivided on the basis of clay-mineral content.

—D.M.C.M.

[379] 631.414.2 : 549 : 537.533
MACKIE, W. Z.; CHATTERJEE, B.; JACKSON, M. L. **Mineral crystal forms in soils observed in the electron microscope: I. Single-component clays and synthetic mixtures.** *Proc. Soil Sci. Soc. Amer. 1947*, 12, 1948 (176-179). [Univ. Wisc., Madison]

The aim of the study has been to use the electron microscope in the identification of sub-groups or species of clay minerals present in soils after the groups have been identified by X-ray diffraction analysis. The crystal form of any species was greatly influenced by the particle-size fraction being observed, the nature of base saturation employed, and the concentration of the suspension used. Illite showed thin tabular crystals with sharp edges and no curling. Mica-intermediates showed irregular aggregates of very fine crystals, some samples tending to curl like montmorillonite. Montmorillonite-group crystals occur as discrete crystals, films or aggregates according to degree of dispersion and whether or not the sample had flocculated during drying. In mixtures of clay soils, the different mineral species usually tended to segregate into separate micro-areas of the specimen. This effect hampers quantitative but greatly assists qualitative estimation of the different components. To obtain maximum dispersion for examination, it is considered advantageous to use Na-saturated clays, as Ca or H clay flocculates during drying.

[380] 631.414.3
WIKLANDER, L.; GIESEKING, J. E. **Exchangeability of adsorbed cations as influenced by the degree of saturation and the nature of the complementary ions with special reference to trace concentration.** *Soil Sci.* 66, 1948 (377-384). [Ill. Agric. Expt. Sta.]

By using radioactive K and Sr, with Na and Ba used as complementary ions in both cases, the exchangeability of ions adsorbed on Amberlite at very low degrees of saturation was studied. With decreasing K content, the exchangeability of K decreased when Na was the complimentary ion, but increased when Ba was the complementary ion. The exchangeability of Sr showed the same tendencies. For both K and Sr the percentage replacement approached a limiting value at a very low degree of saturation.

[381] 631.414.324 : 631.414.2
MARSHALL, C. E.; MCLEAN, E. O. **The activities of calcium and potassium ions as related to concentration and drying in clay suspensions.** *Proc. Soil Sci. Soc. Amer. 1947*, 12, 1948 (172-175). [Missouri Agric. Expt. Sta. Columbia]

K and Ca ion activities as measured by clay-membrane electrodes increased markedly with clay concentration for samples of (1) montmorillonite, (2) beidellite, (3) illite and (4) kaolinite. The percentage ionization varied relatively little with concentration. A reduction of cationic activity due to previous drying was shown with K by (1) and (2) and did not appear at all with (4). (3) showed the effect slightly. Only (1) clearly showed the effect with Ca.

In preliminary experiments with whole soils, K and Ca activities determined on Cecil subsoil and Putnam silt loam increased rapidly with increasing soil:water ratios. The measurements extended up to about pF 3.

[382] 631.415.1 : 546.22
EMBLETON, T. W.; BOYNTON, D.; MACDONALD, H. A. **Acidification of the soil in North-eastern apple orchards.** *Proc. Soil Sci. Soc. Amer. 1947*, 12, 1948 (370-372). [Cornell Univ., Ithaca, N.Y.]

Preliminary studies of soil acidification in 2 apple orchards in which the scab-susceptible McIntosh apple is sprayed with elemental S tend to confirm that acidification is very rapid. Inability of grass to grow under the trees, and in some cases Mg deficiency, may have been brought about by the resultant loss of nutrients. An application of 4 tons/acre of magnesium limestone to an orchard occasionally showing Mg-deficiency symptoms appreciably increased the pH, but, below the surface inch, pH was far lower than that of unlimed grassland outside the orchard. 11 months after treatment, Mg deficiency was again evident on some of the limed trees.

[383] 631.415.3 : 551.55
SAKHAROV, D. **[Impulverization of salts in the Volga-Akhtubin region.]** *Pochvovedenie* 1948 (576-577). [R.] [Astrakhan]

Salts are carried by the wind and deposited on the soil surface or on the vegetation in this region when the wind is in the east or south-east and of a definite strength. The phenomenon may occur several times in a year and lasts for 2-3 days. It can cause serious damage to crops. Rough measurement showed that in one impulverization about 11 gm. of salts were deposited on 1 square metre of surface. Ca, Cl and SO_4 were the main ions in the salts. It is suggested that impulverization may be an important cause of soil salinity in the neighbourhood of saline water sources.

[384] 631.415.3 : 620.19
MANSON, P. W.; MILLER, D. G. **Essential characteristics of durable concrete drain-tile for alkali soils.** *Agric. Engng.* 29, 1948 (485-487, 489).

The sulphate resistance of concrete is discussed under the headings: surface coatings, admixtures or additions, curing conditions, chemistry of cement, how to make sulphate-resistant concrete drain tile and methods of determining sulphate resistance.

631.416 COMPOSITION OF SOILS

(*See also* Abs. Nos. 528, 548, 728, 771)

[385] 631.416 : 581.192
COOPER, H. P.; MITCHELL, J. H.; PAGE, N.R. **The relation of the energy properties of soil nutrients to the chemical composition of crop plants.** *Proc. Soil Sci. Soc. Amer. 1947*, 12, 1948 (364-369). [S.C. Agric. Expt. Sta., Clemson]

In support of the view that a close relationship exists between the relative strength of nutrient ions as indicated by standard electrode potentials and the quantity, on a percentage or m.e. basis, of the nutrients contained in plants, tables are presented relating relative strengths to nutrient contents in numerous crop plants. The ratios of nutrients are also presented, on both the m.e. and the percentage basis. The results are shortly discussed in terms of selective absorption and exclusion.

[386] 631.416 : 631.432.3
VOLK, G. M.; BELL, C. E. **Effect of anion balance on the leaching of ions from sandy soils.** *Proc. Soil Sci. Soc. Amer. 1947*, 12, 1948 (188-190). [Fla. Agric. Expt. Sta., Gainesville]

This work expands, to include Na, Mg and Cl ions, a previous study with K, Ca, NO_3 and SO_4 (see *Soils and Fert.* 9 [198]). Series of analyses were made of successive leachates from lysimeters which had received (in bands, or broadcast with or without lime) a treatment with Mg, Na and K in combination with SO_4, NO_3 and Cl respectively, or had received other (broadcast and unlimed) combinations of the same radicles.

The crest of concentration of soluble salts occurred with the passage of about 6.6 inches of water after treatment. Ca and Mg were similar in their responses to variation in anion concentration, and there was only slight difference in their response to Cl, NO_3 and SO_4 ions. A Ca : Mg m.e.-movement ratio of 5-6.5 was maintained in all unlimed treatments, except with band placement, where the increased Mg concentration resulted in increased relative movement. The Na crest was slightly delayed (7.2 inches), except with band placement, probably due to progressive saturation of the exchange complex with Na. NO_3 and Cl showed a generally similar movement pattern, although nitrate crests and totals were influenced by NO_3 originating from the soil. 52% more SO_4 moved from the band than from broadcast placement. This is the reverse of earlier results of SO_4 applied as gypsum and may be attributed primarily to differential solubility at the band concentration and the nature of associated ions. 90% more SO_4 was lost from the soil at pH 6.9 than at pH 6.1, and the SO_4 crest under broadcast treatment came after 14 inches as compared with 11.4 for the limed soil or band placement. With a heavy application of Na, Mg and K sulphates the SO_4 crest appeared at 7.9 inches. It thus appeared that conditions tending to break the micelle bond with the SO_4 ion enhanced SO_4 leaching. K in general was so low as to be of little significance in ion balance in the leachates, and the amount leached was very small where exchange K was low. Significant variations, due to nutrients residual from treatments given in

the previous study ending 3 years before the present study began, occurred only with residual K.

[387] 631.416 : 631.582 : 631.86
KUBOTA, J.; RHOADES, H. F.; HARRIS, L. **Effects of different cropping and manurial practices on some chemical properties of an irrigated chestnut soil.** *Proc. Soil Sci. Soc. Amer. 1947*, 12, 1948 (304-309). [Bur. Pl. Indust., U.S.D.A.]

Samples of irrigated Tripp very fine sandy loam of original pH 7.6 were analysed after 24 and 30 years under the rotations, manured or unmanured: sugar beet, potatoes; oats, beet; oats, potatoes; potatoes, oats, beet; lucerne (3 years), potatoes, oats, beet.

(a) Without manure or lucerne, the N content of the surface foot was 30% lower than that of virgin soil. (b) 12 tons of manure every 3 years without a legume and (c) lucerne half the time and without manure did not quite maintain the virgin N level. (d) 12 tons of manure every 2 years without a legume and (e) 12 tons every 6 years+lucerne half the time maintained the virgin N level.

Oxidizable-material contents were maintained to about the same degree as N contents, and nitrification rates were closely associated with these, although both manure and lucerne increased nitrification rates more than they increased N and oxidizable-material content. Soluble-P content was related to the amount of manure applied and was lower with rotations including lucerne. The exchangeable-K content was markedly increased by manuring and noticeably reduced by lucerne. Cropping without manure or lucerne did not change the percentage saturation with exchangeable K from that of the virgin soil. There was very little change in soil reaction over the 30 years.

[388] 631.416.1 : 551.577
KUDRIN, S. A. **[The entry of nitrogen in atmospheric precipitations into soils of the serozem zone.]** *Pochvovedenie* 1948 (608-611). [R.]

The NH_3-N, NO_2-N and NO_3-N content of rain and snow was measured for 2 years near Tashkent. Data are presented as mg. of N per litre of precipitation for each month. The first year was rather drier and the second rather wetter than the average. In each year the concentration of NH_3-N was about 0.6 mg./l. over the year, and the concentrations of NO_3-N were 0.07 in the dry and 0.08 in the wet year. Only traces of NO_2-N were found. The concentration of NO_3 was highest in periods of thunderstorms, and the concentrations of both NH_3 and NO_3 tended to be least in heavy downpours. In light showers the concentration of NH_3 increased relatively to that of NO_3. In all about 2 kg./ha. of N fell on the soil in the dry year, and 3.5 kg./ha. in the wet year, 90% of this quantity being NH_3-N.

[389] 631.416.2 : 631.414.3
COPPENET, M.; BOISCHOT, P. Fixation de l'ion phosphorique sur le calcaire. **[The fixation of the phosphate ion on calcium carbonate.]** *C.R.* 227, 1948 (1166-1168). [F.]

Evidence is offered that this type of fixation, under the conditions of concentration and pH commonly met in soils, is not a chemical combination but an adsorption. The P_2O_5 adsorbed on the surface of $CaCO_3$ particles passes into the soil solution by a process of desorption brought about by the influence of the humic anion.

[390] 631.416.2 : 631.414.3
GOLDSCHMIDT, W. B. **Phosphate studies in lowveld soils.** *Farm. S. Africa* 23, 1948 (531-534, 576). [Hort. Res. Sta., Nelspruit]

Coarse sandy loam of granitic origin that had received annual applications of 640 lb./acre of super. for 9 years was sampled at depths of 0-3, 3-6, 6-12 and 12-24 inches. P content increased appreciably up to 6 inches depth, but only slightly at 6-12 inches and below 12 inches there was no measurable increase. The soil had a fixing capacity of 6% which is high enough to justify placement in rows of P fertilizer. Soils which received annual applications of lime for 9 years were sampled at the same depth. Effective penetration of lime did not exceed 6 inches, and if lime is to be used effectively to reduce P fixation it should be ploughed under to get it as near as possible to the root zone of the plant. It is recommended that rock phosphate, gypsum and agricultural lime should be broadcast, ploughed under and the land sown to a legume which is later ploughed under.

[391] 631.416.2 : 631.414.3
SOKOLOV, A. V.; KORITSKAIA, T. D. **[The movement of phosphates in soils.]** *Pochvovedenie* 1948 (636-640). [R.]

The effects of temperature, moisture condition, size of aggregate and rate of percolation on P fixation were observed. Slight (possibly not significant) decreases in P fixation accompanied lowering the temperature, and increasing the degree of moisture saturation, the size of aggregate and the rate of percolation.

[392] 631.416.2 : 631.414.3 : 549.623.9
LOW, P. F.; BLACK, C. A. **Phosphate-induced decomposition of kaolinite.** *Proc. Soil Sci. Soc. Amer. 1947*, 12, 1948 (180-184). [Iowa Agric. Expt. Sta., Ames]

Phosphate fixation by kaolinite is accounted for by the hypothesis that kaolinite dissociates into Al and silicate ions, and that P precipitates the Al, disturbing the equilibrium and causing the clay to dissolve in accordance with solubility-product principles. The addition of both P and 8-hydroxyquinoline to kaolinite considerably increased the silica concentration in the solution, whereas NH_4Cl, which does not precipitate Al, caused only a small increase in dissolved silica. Extraction of phosphated kaolinite with NH_4 oxalate liberated Al and P in a constant ratio despite variations in time of extraction and quantity of fixed P in the clay, indicating that P in the phosphated kaolinite was present as an Al phosphate and not as a "kaolinite phosphate".

[393] 631.416.2 : 631.414.3 : 631.824
PERKINS, A. T. **Phosphate solubility in relation to cations and pH : magnesium.** *Proc. Soil Sci. Soc. Amer. 1947*, 12, 1948 (185-187). [Kans. Agric. Expt. Sta., Manhattan]

The effects of Ca, Mg and $Fe^{\cdots}$ on phosphate solubility in the presence of kaolin were studied in the pH range of 2.5-9.5. The purpose was to help evaluate the use of dolomitic instead of calcitic limestone on acid soils deficient in phosphate. The results show: (1) As the pH increased, P fixation by Ca increased steadily, except for a small dip at pH 5.5; with Mg it increased to pH 4 and then steadily decreased and with Fe it steadily decreased throughout the range. (2) At acid reactions Ca precipitates slightly more P than Mg does, but at basic reactions much more. (3) Increasing cationic concentration increased precipitation whether single or mixed cations were used. (4) In the higher cationic concentrations a mixture of Ca and Mg precipitated less P than Ca alone and often less than Mg alone. (5) The more complex the cation solution at a given concentration, the less was the P precipitation, especially below pH 7 and in the more concentrated mixtures.

[394] 631.416.2 : 631.417 : 631.436
THOMPSON, L. M.; BLACK, C. A. **The effect of temperature on the mineralization of soil organic phosphorus.** *Proc. Soil Sci. Soc. Amer. 1947*, 12, 1948 (323-326). [Iowa Agric. Expt. Sta., Ames]

Three Iowa soils developed under grass were incubated for 1 week at temperatures ranging from —14°C. to +150°C., and the increase in inorganic P soluble in normal H_2SO_4 was determined as a measure of the mineralization of originally organic P. The increase in acid-soluble P over the range —14°C. to +30°C. was only about 5 p.p.m., but above 30°C. there was vary rapid increase continuing up to 150°C. at which temperature the organic P was completely mineralized. Below 50°C. soils incubated with toluene mineralized 3 times as much P as those without toluene, but above 50°C. the toluened soils mineralized less than the un-toluened. Thus the summer heating and partial sterilization due to summer drying may explain why in such soils, high in organic P, the oat crop and the first cuttings of leguminous hays respond to P fertilizing in the spring, whereas maize and the summer second cutting do not.

[395] 631.416.2 : 631.432.3
MACINTIRE, W. H.; WINTERBERG, S. H.; CLEMENTS, L. B. ET AL. **Phosphate migration in limestoned and dolomited soils as registered by plant response.** *Proc. Soil Sci. Soc. Amer. 1947*, 12, 1948 (359-363). [Tenn. Agric. Expt. Sta.]

After 12 years' exposure to rain, the top, middle and bottom zones of 3 silt loams which had received 11 annual additions of 96 lb. of P_2O_5 as super. or rock phosphate, with or without the previous addition of 2000 lb. of CaO as limestone or dolomite, were used in pots for P-migration studies.

One soil showed significant migration to the middle zone on the limed plots, but little to the bottom zone, and on the unlimed plots there was virtually no migration. With the second soil, aggregate crop growth was greater in soil from the limed plots, but in the middle zone P_2O_5 uptake was the same for limed and unlimed soil. The third soil, which is rather infertile and underlain by a natural claypan, had suffered considerable leaching of P, and the P_2O_5 content of the crops grown on the middle and bottom layers of this soil exceeded that found in the crops grown in the corresponding layers of the other 2 soils. Rock phosphate gave very little response in any soil.

[396] 631.416.4 : 549
GRAHAM, E. R.; TURLEY, H. C. **Soil development and plant nutrition: III. The transfer of potassium from the non-available to the available form as reflected by the growth and composition of soybeans.** *Proc. Soil Sci. Soc. Amer. 1947*, 12, 1948 (332-335). [Missouri Agric. Expt. Sta., Columbia]

A study of the physical and chemical weathering of (a) a granite, (b) a wyomingite and (c) a glauconitic dolomite containing respectively 5, 11.4 and 5% of K, and of the uptake of K by soybeans grown on the different minerals with colloidal clays carrying other nutrients and having different levels of Ca and Mg saturation, showed: (1) freezing and thawing of a 5% mixture of the silt-size minerals with water rendered K replaceable in significant amounts from (b) and in less significant amounts from (c) whereas there was little or no release from (a); (2) H-clay mixed with the minerals caused the release of K into the replaceable form from (b) and (c) but had little effect on (a); (3) soybeans grown on the mixtures of H-clay with (a) at the levels of clay saturation used contained no more K than that originally present in the seeds: this held also for soybeans grown on (b) at the low level of clay saturation; (4) soybeans grown on (b) at the medium level of clay saturation and those grown on (c) at both levels showed an increase in K content over that of the seeds.

[397] 631.416.4 : 631.414.3
EVANS, C. E.; ATTOE, O. J. **Potassium-supplying power of virgin and cropped soils.** *Soil Sci.* 66, 1948 (323-334).

The K-supplying power of a soil is a measure of the rate of transformation of fixed K to the exchangeable form. In soils with an originally high level of exchangeable K, Ladino clover removed 1.2-1.7 times as much non-exchangeable K as did oats which, however, were superior to the clover in this respect in soils of originally low exchangeable-K content. The liming of acid soils repressed the amounts of total and non-exchangeable K removed by plants; this effect is often beneficial in conserving K—when present in large amounts—from luxury consumption by plants. In soils leached with $CaCl_2$ $MgCl_2$ solution before cropping, oats removed up to 3 times as much fixed K as from unleached soils. High fixing power for applied K was closely associated with high supplying power of fixed K to crops and high pH and/or high base-exchange capacity. Oats in pots recovered 24-47% of the amounts fixed.

[398] 631.416.4 : 631.414.3
REITEMEYER, R. F.; HOLMES, R. S.; BROWN, I. C. ET AL. **Release of non-exchangeable potassium by greenhouse, Neubauer and laboratory methods.** *Proc. Soil Sci. Soc. Amer. 1947*, 12, 1948 (158-162). [Bur. Pl. Indust., Beltsville, Md.]

Detailed studies of the release of non-exchangeable K were made on 14 soil samples from 6 states of the eastern humid area. 9 samples represented a series of field treatments involving differential K and organic-matter applications. Release was measured by 2 years of Ladino clover growth, 7 months of moist storage with or without 10 cycles of freezing and thawing in every 30-day period, 30-day electrodialysis, a modified Neubauer procedure, and acid digestion. Correlations between the results of the clover method and those of each of the last 3 methods were highly significant, the regression relationship of clover on dialysis being best from the viewpoints of precision and order of magnitude.

[399] 631.416.4 : 631.414.3 : 549
STANFORD, G. **Fixation of potassium in soils under moist conditions and on drying in relation to type of clay mineral.** *Proc. Soil Sci. Soc. Amer. 1947*, 12, 1948 (167-171). [Agric. Expt. Sta., Ames, Iowa]

Experiments with electrodialysed illite and acid-washed bentonite indicate that mica-

ceous minerals are responsible for rapid moist K fixation in calcareous soil, owing to the fact that Ca, Mg and Na are quite readily replaced by K. The fixation is an exchange reaction. Montmorillonite does not fix K except on drying, and drying increases the fixation by illite. Acid illite under moist conditions, however, fixes only fairly small quantities of K unless NaOH, $Ca(OH)_2$, phosphate, fluoride, etc., are used to remove H, Fe and Al ions (by an exchange reaction) from the intramicellar spaces. With the exception of fluoride, these treatments reduced the drying fixation in bentonite probably through a blocking of exchange positions of interplanar surfaces.

[400] 631.416.4 : 631.417.2
JONES, U. S. **Availability of humate potassium.** *Proc. Soil Sci. Soc. Amer. 1947*, 12, 1948 (373-377). [Univ. Wis.]

Humate K is that held in exchangeable or readily available form by humic acid. Ash-free humic acid was saturated with a constant amount of exchangeable K and various amounts of exchangeable Ca and H. At equilibrium with water and carbonated water, 50-90% and 82-96% respectively of the total-exchangeable K present was in solution. As Ca saturation increased from 0 to 80%, increasing amounts of K dissolved, but beyond this point there was little increase. The percentage Ca saturation thus had little influence on the extraction of humate K by carbonated water. Humic acid at equilibrium with a K_2CO_3 solution held only half the exchangeable K that was held by an equivalent amount of H-bentonite, but humate K was more readily available to maize than that held by bentonite. Exchangeable K in a peat soil was extracted 4 times as readily with water and carbonated water as that in a sample of silt loam practically free of organic matter.

[401] 631.416.4 : 631.81
SMITH, G. K.; OBENSHAIN, S. S. **The effect of certain fertilizer and manure treatments on the exchangeable potassium in the surface and subsoil of Dunmore Silt Loam.** *Proc. Soil. Sci. Soc. Amer. 1947*, 12, 1948 (300-303). [Va. Agric. Expt. Sta., Blacksburg]

On the limed silt loam of a 4-course-rotation experiment, both muriate of potash and manure applied over 33 years significantly increased the exchangeable K of surface- and subsoil. The subsoil was significantly lower in exchangeable K. A complete fertilizer increased yields and seemed to cause a greater utilization of the applied K in that less exchangeable K was leached to the subsoil. The differences in exchangeable-K content between the muriated and the unfertilized plots were for the surface soils about 15% of the total K added during the experiment and for the subsoils 8.7%.

[402] 631.416.856 : 581.192
STENBERG, M.; EKMAN, P.; LUNDBLAD, K. ET AL. Om kopparhalt i jord och vegetation och resultat av fleråriga gödslingsförsök i koppar. **[The copper content of soil and vegetation and results of long-term fertilizer experiments with copper.]** *Medd. Kgl. LantbrAkad. Vetenskapsavd.* 4, 1949, pp. 106. [Sw.e.]

The Cu content of Swedish peat soils ranged from 2 to 180 p.p.m., and of mineral soils from 2 to 150 p.p.m. Cu-deficient peat soils occur throughout the country and particularly in the north; Cu-deficient mineral soils occur in the south (Götaland) and are usually sandy. Cu-rich mineral soils occur in central Sweden. Judged by the Cu content of plants grown on the soils, the availability of Cu is greater in peat than in mineral soils.

In fertilizer experiments 5-250 kg./ha. of $CuSO_4$ were applied. Often little effect was observed for several years. The Cu appeared to be extremely immobile in the soil and after 6 years all the Cu applied as a top-dressing was found in the top 5 cm. of soil. Hay yields were not affected by Cu fertilizing, but the Cu content of the hay was increased, and this is said to have produced a significant improvement in hay quality. Effects on yields of cereals were variable, probably due to the fact that Cu does not operate in the year of application. In one experiment a field in grass top-dressed with Cu in 1941 and ploughed in 1947 gave an increase of 80% in yield of grain. The Cu content of grains tends to increase with Cu fertilizing.

In general, soils with low Cu contents respond to Cu fertilizers. Soils with less than 10 kg./ha. of Cu in the arable layer may be regarded as deficient. Applications of Cu may, however, accentuate existing deficiencies of Fe and Mn. There is no direct

relationship between pH and Cu status of a soil. Where deficiency occurs, a single application of 25-40 kg./ha. of $CuSO_4$ will usually remove it for several years.

[403] 631.416.872

OLSON, R. V. **Iron solubility in soils as affected by pH and free iron oxide content.** *Proc. Soil Sci. Soc. Amer. 1947*, 12, 1948 (153-157). [Kansas Agric. Expt. Sta., Manhattan]

Ferric and ferrous Fe in soils of the planosol, chernozem, chestnut and brown groups were determined by a colorimetric method employing orthophenanthroline. Water, CO_2 and neutral NH_4-acetate extracts usually contained too little Fe to be measured. NH_4 acetate adjusted to pH 4.8 with acetic acid extracted amounts varying from 0.15 p.p.m. in alkaline soils to 20 p.p.m. in acid soils. At pH levels above 4.5, the presence was indicated of organic- or inorganic-Fe compounds which were more soluble than Fe sulphate. There appears to be a difference in the amount or form of iron in acid soils as compared to neutral or alkaline soils. The results indicate that pH is not the only factor affecting the solubility of Fe in soils and the ability of soils to supply Fe to plants : at least one other factor is the amount of free Fe oxides present.

631.417 ORGANIC MATTER

(*See also* Abs. Nos. 423, 449, 690)

[404] 631.417.2

ENDERS, C.; TSCHAPEK, M.; GLAWE, R. Vergleichende Untersuchungen einiger kolloider Eigenschaften von natürlichen Huminsäuren und synthetischen Melanoidinen. **[Comparative studies of some colloid properties of natural humic acids and synthetic melanoidins.]** *Koll. Ztschr.* 110, 1948 (240-244). [G.]

The melanoidins were partly soluble in NaOH and the resulting Na compounds, unlike the Na humates, were only partially reversible. From the hydrophilic aspect the melanoidins are similar to the humic acids, and they have a similar acidity, but the humic acids have a greater exchange capacity. The differences noted are not considered to dispose of the view that the formation of humic acid proceeds in the same or a very similar way to that of the melanoidins.

[405] 631.417.2 : 631.468

FRANZ, H; LEITENBERGER, L. **Biochemical researches on humus formation by soil fauna.** *Österreich. Zool. Ztschr.* 1, No. 5, 1948. C.A. 42 (9028). [Bundesanst. Alpine Landw. Admont, Steiermark]

The reduction of crude organic material to humus is aided by an active chemical process of the soil fauna. Under the laboratory conditions of the investigation, the soil fauna was able to convert fresh material such as fresh leaves, clover and grass into humic substances. Data are given for the percentage of dry substance, organic matter and humic-acid content of excrement from earth worms, various species of caterpillars and other forms of soil fauna.

631.418 SOIL SOLUTION

[406] 631.418 : 532.712 : 581.032.3

FEDOROVSKY, D. V. **[The dependence of the wilting coefficient on the kind of plant and the osmotic pressure of the soil solution.]** *Pochvovedenie* 1948 (612-621). [R.]

The wilting points of different plants (including cucumber, flax and wheat) in the same (chernozem) soil varied by up to 4%, corresponding to a 25% difference in the amount of unavailable water in the soil. These differences were maintained in soils of different texture. Increasing the osmotic pressure of the soil solution by adding NaCl considerably raised the wilting point of all plants except certain halophytes in which strong absorption of chloride also greatly increased the concentration of the cellular fluid.

[407] 631.418 : 631.415.3 : 525.5

SHAVRYGIN, P. I. **[Soil solutions in saline soils.]** *Pochvovedenie* 1948 (717-725). [R.]

Soil samples were taken with an augur at different times of the year, and the soil solution expressed under pressure. The salt concentration was very much greater in summer than in winter—e.g., 5 g./l. in summer, 275 in winter in one soil ; 8 in summer, 420 in winter in another, in the top 5 cm. The concentration fell with depth. In irrigated soils (serozems) chlorides predominated over sulphates, and vice versa in unirrigated soils (solonchaks). NaCl and

$MgSO_4$ were the principal salts during the summer, the relative content of Na_2SO_4 increased during the winter.

Cotton seedlings can tolerate a concentration in the soil solution of 8-9 g./l. The concentration should not exceed 12-16 g./l. during the growing season.

631.42 TECHNIQUE AND ANALYSIS

(*See also* Abs. Nos. 448, 654, 678, 679)

[408] 631.422

COOK, R. L.; ROBERTSON, L. S.; LAWTON, K. ET AL. **Green tissue testing with the Spurway soil testing equipment as an aid in soil fertility studies.** *Proc. Soil Sci. Soc. Amer. 1947*, 12, 1948 (379-381). [Mich. Agric. Expt. Sta.]

The Spurway Simplex soil-testing outfit has been successfully used to indicate the extent to which nitrate-N, P and K are being stored within the plant. With sugar beet it was possible to point out which plants had received insufficient N for maximum yields and with lucerne and clover it was usually possible to distinguish between treated and untreated plots and between plots treated with P alone or K alone.

[409] 631.422

LAWTON, K.; ROBERTSON, L. S.; COOK, R. L. ET AL. **A study of correlation between rapid soil tests and response of legume hay to phosphorus and potassium fertilization on some Michigan soils.** *Proc. Soil Sci. Soc. Amer. 1947*, 12, 1948 (353-358). [Mich. Agric. Expt. Sta., East Lansing]

The methods tested in 36 counties of Michigan were those of Peech and English, Bray, and Spurway ("active" and "reserve" methods). A general but not exact relationship was found between response to fertilizers and the amount of P and K extracted by the rapid tests. The accuracy of prediction of response to K was about 60% and to P about 80%, dropping to 65% one year after the fertilizer was applied. Grouping the soils into 3 textural and drainage categories indicated that the critical nutrient-response levels of (a) well drained sandy soils, (b) well drained loams and silt loams, and (c) poorly drained heavy-textured soils are sufficiently different to warrant separate interpretation. With alkaline soils, tests using weak acid extractants were superior to those using strong acid in separating the soils into responding and non-responding groups, but no individual test was superior when all types of soil were included. It is concluded that rapid soil tests, when calibrated against field trials, are of value in predicting when legume hays will respond to added fertilizer.

[410] 631.422

LYND, J. Q.; TURK, L. M. **Permanent plastic standards for rapid soil and plant tissue testing.** *J. Amer. Soc. Agron.* 40, 1948 (940-941). [Mich. St. Coll., E. Lansing]

Satisfactory permanent plastic standards have been prepared for determinations of P, K, Mg and Ca. These standards are convenient and simple to use and are especially adapted for field testing and for student use in the laboratory.

[411] 631.422 : 631.416.5

BOWER, C. A. **Rapid tests for soluble and exchangeable sodium in saline and alkali soils.** *J. Amer. Soc. Agron.* 40, 1948 (1100-1105).

The estimation of Na in soil extracts is based upon the decrease in the specific gravity of the supernatant liquid obtained when the Na in a 4-ml. aliquot of a soil extract is precipitated by the addition of 20 ml. of uranyl-zinc-acetate reagent. Soluble Na is estimated on a saturated or 1:1 soil water extract, while soluble plus exchangeable Na is estimated on a 1:1 or 1:2 soil extract made with 1 M calcium chloride solution. Exchangeable Na is obtained by difference. Comparison with standard quantitative methods showed that the rapid tests were sufficiently reliable to be of practical use in the diagnosis of saline and alkali soils.

[412] 631.423.3 : 631.416.12

UBALDINI, I.; GUERRIERI, F. **Determination of nitrites in coloured aqueous liquids and in soils.** *Ann. Chim. Appl.* 38, 1948 (235-240). B.A.C. 1948 (247).

The liquid or soil extract is shaken with a mixture of aqueous $KHSO_4$, CCl_4 and isoamyl alcohol. The solvent extracts are then distilled with MeOH into a mixture of

sulphanilic acid, acetic acid and water. Acetic acid containing 1-naphthylamine is added and the nitrite determined colorimetrically.

[413] 631.423.3 : 631.416.2
BURRIEL, F.; HERNANDO, V. **Phosphorus in soils. I. Colorimetric determination of phosphorus.** *An. Fis. Quim.* 43, 1947 (933-958). B.A.C. 1948 (247).
Modifications are proposed for the colorimetric determination of P by means of Mo-blue. See *Soils and Fert.* 11 [792] for details.

[414] 631.423.3 : 631.416.313
ELSUKOV, I. E. [**A field method of determining the degree of salinization of soil with chloride.**] *Pochvovedenie* 1948 (734-741). [R.]
The soil is brought to full moisture capacity (judged by the eye), and a sample of 1-2 g. is spread on a watch glass and covered with a wad of filter paper of definite area that is gently pressed onto the soil, absorbing some of the soil solution. Cl in the solution is determined by titration with silver nitrate in presence of potassium chromate. Titration is carried out by dropping the nitrate from a pipette and counting the number of drops. Calibration of the Cl value of a drop is made by titrating a solution from a soil of known Cl content.

[415] 631.423.3 : 631.416.316
FELLENBERG, T. VON [**Significance of fluorine for teeth.**] *Mitt. Lebensm. Hyg.* 39, 1948 (124-182). B.A.C. 1948 (251).
The preparation for analysis of samples of water and materials such as soils and fertilizers is detailed. The sample is then distilled with concentrated $HClO_4$, and Na alizarinsulphonate and a HCl-Th solution added to the distillate. The solution is then titrated to its original Th content with standard $Th(NO_3)_4$, using a blank for matching.

[416] 631.423.3 : 631.416.4/5
MYERS, A. T.; DYAL, R. S.; BORLAND, J. W. **The flame photometer in soil and plant analysis.** *Proc. Soil Sci. Soc. Amer. 1947,* 12, 1948 (127-130). [U.S. Geol. Surv. and U.S.D.A.]
The flame photometer can be employed directly for determining K in the NH_4-acetate leachates of soils. The results agree with those of the cobaltinitrite method and there is no need to destroy the organic matter. Average amounts of Ca and Mg need to be included in the standards used for calibration and the acid should be constant in samples and standards. The use of one standard containing both Na and K gave good results. For accurate work, the capillaries and atomizing chamber must be frequently cleaned in hot detergent solutions ; viscous solutions and variations of gas and air pressure must be avoided and an efficient filter must be used in the compressed-air line. Sub-professional technicians have obtained reliable results for K and Na in a time which is within the range of that of the rapid soil tests.

[417] 631.423.3 : 631.416.4
HAVE, J. TEN [**The determination of potassium in soil and plant material by the cobalt-nitrite method.**] *Chem. Weekbl.* 44, 1948 (484-488). C.A. 42 (9027).
The composition of the Na-K-Co-nitrite precipitate in this method varies with temperature and solubility, the amount of Na being especially subject to variation. The dried extract freed from insoluble material and NH_4 salts is taken up in 10 ml. of water and 5 ml. of saturated NaCl solution. The solution is kept at 25° for 20-30 minutes, treated with 5 ml. of Na-Co-nitrite reagent and shaken. Next day the precipitate is filtered, washed with 10% acetic acid and once with water, twice with 96% alcohol and twice with acetone, is dried for half an hour and weighed. For titrimetry the alcohol and acetone washings are omitted, the precipitate being washed into a beaker with 40-60 ml. of water, treated with 5 ml. of 10% H_2SO_4 and an excess of $KMnO_4$ and kept 10 minutes. Oxalic acid equivalent to the $KMnO_4$ is added, the solution is boiled and titrated with $KMnO_4$. With 3.16 and 15.79 mg. of K_2O present, 1 ml. of 0.1 n, $KMnO_4$ is equivalent to 0.749 and 0.776 mg. of K_2O respectively.

[418] 631.423.3 : 631.416.834
FLETCHER, M. H. **Determination of lithium in rocks by distillation.** *Anal. Chem.* 21, 1949 (173-175). [U.S. Bur. Mines]
Li was extracted from minerals containing less than 0.0005% of Li_2O by heating a mixture comprising 1 g. of ground sample, 2.9 g. of $CaCO_3$ and 0.56 g. of $CaCl_2$ at 1200°C.

for 30 minutes. The volatilization product was collected in a plug of Pyrex glass wool from which it was dissolved by dilute HCl. Li was estimated by a standard procedure. Li_2O was recovered from synthetic samples with an average error of 1.1%.

[419] 631.423.3 : 631.416.846
DROSDOFF, M.; NEARPASS, D. C. **Quantitative microdetermination of magnesium in plant tissue and soil extracts.** *Anal. Chem.* 20, 1948 (673-674). [U.S.D.A., Gainesville]

The thiazole-yellow method for estimating Mg in plant tissue and soil extracts was investigated. It was found necessary to include Mn and P in the compensating solution in addition to Ca and Al, as high results were given in the presence of large amounts of Mn and as the colour was intensified in the presence of PO_4'''. Values obtained by the colorimetric and standard gravimetric methods were in good agreement for the determination of exchangeable Mg in soils. The coefficient of correlation was +0.9985, and the coefficient of regression of gravimetric on colorimetric values was 1.097 ± 0.025, which has high statistical significance.

[420] 631.423.3 : 631.416.847
WEAR, J. I.; SOMMER, A. L. **Acid-extractable zinc of soils in relation to the occurrence of zinc-deficiency symptoms of corn: a method of analysis.** *Proc. Soil Sci. Soc. Amer. 1947*, 12, 1948 (143-144). [Ala. Agric. Expt. Sta., Auburn]

The method of extraction and analysis (dithizone) is a combination and modification of methods already in use. The use of 0.1 n. HCl as the extractant reduces the time taken and the volume of the extracting liquid. Alexander and Taylor's procedure [Improved procedure for determination of zinc in foods. *J. Assoc. Off. Agric. Chem.* 27, 1944 (325-331)] for flocculation and precipitation of sulphides not easily soluble is modified in that the first filtration is not made until after treatments with H_2S. With this method, a set of determinations can be completed within a working day.

[421] 631.423.3 : 631.811.4
CAROLAN, R. J. **Influence of heating on the pH of soil suspensions.** *Soil Sci.* 66, 1948 (417-420). [Irish Sug. Co. Res. Lab.]

At least 8 hours' shaking is required to bring a suspension of soil and lime water to equilibrium pH, whereas heating the suspension for 5 minutes on a water bath gives approximately the same pH value. Soil-buffer curves showing the changes in pH of soil suspensions treated with various amounts of lime water and heated for 5 minutes can be rapidly determined by this method, the lime additions being expressed in tons of CaO per acre of topsoil. With an exceptionally sandy soil the heating method gave the value 8.1 as against 7.5 by shaking.

[422] 631.423.3 : 631.811.4
WOODRUFF, C. M. **Determination of the exchangeable hydrogen and lime requirement of the soil by means of the glass electrode and a buffered solution.** *Proc. Soil Sci. Soc. Amer. 1947*, 12, 1948 (142-144). [Univ. Missouri, Columbia]

In addition to the author's method for determining the lime requirement of a soil (see *Soils and Fert.* 11 [1434]) a glass-electrode lime meter for use with the buffered solution is briefly described. It is calibrated to read limestone requirement in thousands of lb./acre-plough-depth of soil. Previous knowledge of texture, degree of weathering, organic-matter level or past liming of the soil are not required if this instrument is used.

[423] 631.423.4 : 631.417.748.3
TRACEY, M. V. **The determination of uronic acids in soil.** *Analyst* 73, 1948 (554-555). [Rothamsted]

The determination of uronic acids in soil by the method of Lefèvre and Tollens, in which single samples are boiled with 12% HCl for $5\frac{1}{2}$ hours and the CO_2 estimated, was quickened by heating several samples at the same time with 12% HCl in small sealed tubes at 111°C. in boiling toluene for 5 hours. The CO_2 evolved was introduced into a Van Slyke apparatus by breaking the tube while enclosed in pressure tubing attached to the gas chamber. Carbonates were determined separately and allowed for. Estimations of uronic acid made on a red laterite soil to which MnO_2 had been added showed that satisfactory determinations are possible in the presence of large amounts of Fe and Mn.

[424] 631.423.7
HANNA, W. J.; REED, J. F. **A comparison of ammonium acetate and buffered barium chloride methods for determining cation-exchange properties of limed soils.** *Soil Sci.* 66, 1948 (447-458). [N.C. St. Coll.]

When $BaCl_2$ buffered with triethanolamine is used, the exchange capacity is not affected by pH or the presence of $CaCO_3$. Cation-exchange properties and residual carbonates were determined by buffered $BaCl_2$ and neutral NH_4 acetate for 3 soils variously treated with calcitic and dolomitic hydrated limes and gypsum to give base saturations of 60-90%. The $BaCl_2$ procedure gave higher values for cation-exchange capacity at all degrees of base saturation, mainly because it consistently gave higher values for exchangeable H. The amounts of exchangeable Ca and Mg increased with added lime. At the lower levels of base saturation, the NH_4 acetate extracted the same amount of , or slightly less, Ca and Mg than the $BaCl_2$, and at the higher levels extracted considerably more Ca. The NH_4 acetate, but not the $BaCl_2$, extracted appreciable amounts of $CaCO_3$. From previously untreated soils, mixed in the laboratory with various limes to 90% base saturation, buffered $BaCl_2$ dissolved only small amounts of carbonate.

[425] 631.423.7
MEHLICH, A. **Determination of cation- and anion-exchange properties of soils.** *Soil Sci.* 66, 1948 (429-445). [N.C. Agric. Expt. Sta.]

Methods for determining exchangeable H, Ca, Mg, K, Na, PO_4, soluble Al, and cation- and anion-exchange capacities of soils are described. Enough air-dry soil to give 0.5-2.5 m.e. exchange capacity is leached with $BaCl_2$+trietholamine buffered at pH 8.1, washed with unbuffered $BaCl_2$ and water, and aliquots of the filtrate are taken. H is determined by a simple titration procedure, Mg colorimetrically with thiazol yellow, Ca volumetrically with $KMnO_4$ in the presence of $BaSO_4$, Na and K colorimetrically or with the flame photometer after Ba has been removed as carbonate. Cation-exchange capacity is obtained by the colorimetric determination of Ba as chromate after the replacement of Ba by $CaCl_2$. The result is not affected by the presence of $CaCO_3$ or $MgCO_3$ in the soil. For the determination of anion-exchange capacity, the Ca-soil is treated with H_3PO_4 in an amount equal to the cation-exchange capacity. After 24 hours of contact the pH is measured and the PO_4 adsorbed is determined. The exchangeable PO_4 is determined by replacement with acidified NH_4F. The equilibrium pH (pH*e*) and the cation-exchange/anion-exchange ratios served as a qualitative measure for distinguishing between mineral colloids of the 2 : 1 and 1 : 1 lattice types.

[426] 631.423.7
ROGERS, L. H. **Determination of exchangeable bases with the air-acetylene flame and quartz photoelectric spectrophotometer.** *Proc. Soil Sci. Soc. Amer 1947*, 12, 1948 (124-126). [Fla. Agric. Expt. Sta., Gainesville]

A modified Lundegårdh burner with a Beckman spectrophotometer has been successfully used to determine exchangeable Ca and K in sandy soils. Standards are prepared with known Ca and K concentrations in 0.01 n. HCl, approximately 10 ml. being transferred to sample flasks, and working curves prepared. Once the curves are prepared, the instrument can be reset from one element to another in 2 or 3 minutes, the same solution being used for both elements. 50 g. of soil are leached with 500 ml. of neutral n. NH_4 acetate and a 10 ml. aliquot of the leachate is evaporated to dryness and taken up in 10 ml. of 0.01 n. HCl, in order to use the same anion concentration for both standards and unknowns. In tests of the precision of the method the average deviation of a single measurement was 2.9% for K and 3.4% for Ca. With agricultural materials, the method may be applicable to fewer than 10 of the 30 elements theoretically possible. Na and Sr have adequate sensitivity, but Mn, Cu and Mg occur in such low concentrations in sandy soils that a source working at a higher temperature is required. Exchange capacity of soils can be determined, using Ba or Na (or other cation which can be determined in the flame) as the displacing ion.

[427] 631.423.7
SCHOLLENBERGER, C. J. **Determining total replaceable bases in soils.** *Anal. Chem.* 20, 1948 (1121). [Ohio Agric. Expt. Sta.]

In the determination of total exchangeable bases by evaporating the ammonium-acetate leachate, igniting the residue to carbonates, dissolving in excess standard acid and back-titrating with standard alkali to the methyl-red end point, the ignited residue in certain soils contains much black material insoluble in boiling n. HCl. This residue may consist largely of oxides of Mn that dissolve in the standard acid. Its basicity may be included in the determination by adding 2 or 3 drops of 30% H_2O_2 and allowing to stand for a few minutes before boiling. The added H_2O_2 causes no appreciable error in the titration when the indicator is added in alcoholic solution. Methyl-red is a satisfactory indicator.

[428] 631.423.7 : 631.415.1 : 631.414.3
SARISHVILI, I. F. **[The determination of the absorption of acetic acid by soil.]** *Pochvovedenie* 1948 (184-189). [R.]

It is usually found that the exchange acidity of a soil is greater than its hydrolytic acidity, and many workers have explained this as a result of the absorption of acetic acid from the Na acetate used in the determination of hydrolytic acidity. It was shown experimentally that acetic acid was absorbed from Na acetate (by krasnozems), and that the absorption was greatest where the hydrolytic acidity was greater than the exchange acidity.

[429] 631.425.22 : 581.032.3
VEIHMEYER, F. J.; HENDRICKSON, A. H. **The permanent wilting percentage as a reference for the measurement of soil moisture.** *Trans. Amer. Geophys. Un.* 29, 1948 (887-896). [Univ. Calif., Davis]

Soil moisture used as a percentage on a dry-weight basis or as a ratio of volume of water to unit volume of dry soil without reference to some standard or base for comparison is of limited value. The permanent wilting percentage is remarkably constant and in regions of rainless summers this moisture condition is reached each year in the soil below the surface layer which is affected by surface evaporation. Soil-moisture curves slope downwards approximately uniformly until the wilting point is reached after which they continue nearly horizontal. The permanent wilting percentage is a satisfactory reference point from which the amount of readily-available water and the amount needed to raise the soil to its field capacity may be calculated.

[430] 631.425.4 : 631.437.36
FRIPIAT, J.; CANNIÈRE, J. DE; STOKKINK, G. Recherches sur les processus physico-chimiques résultant de l'application d'un champ électrique à une suspension d'argile. **[Studies on the physico-chemical processes resulting from the application of an electric field to a clay suspension.]** *Agricultura* 45, 1947 (70-87). [F.fl.e.g.] [Univ. Louvain]

It is hoped to characterize soils of different structure by their respective zeta potentials. The velocity of soil particles in suspension under the influence of an electric field is observed microscopically and the mobility is calculated. The total mobility is due to cataphoresis and electro-endosmosis, but by a graphical integration using the theory of errors the mobility due to cataphoresis alone is determined. The zeta potential is obtained by Smoluchowsky's formula.

[431] 631.427.3
CAIN, J. C.; BOYNTON, D. **Some effects of season, fruit crop and nitrogen fertilization on the mineral composition of McIntosh apple leaves.** *Proc. Amer. Soc. Hort. Sci.* 51, 1948 (13-22). [N.Y. St. Agric. Expt. Sta., Geneva and Cornell Univ., Ithaca, N.Y.]

The effects of a heavy fruit crop, an increase in N fertilizer and the advancing growing season were the same, namely K and P reduction and an increase in Ca, Mg and total bases in the leaves.

[432] 631.427.3
NICHOLAS, D. J. D. **The application of rapid chemical tests to the diagnosis of mineral deficiencies in horticultural crops. I. Crops grown on a manurial trial.** *J. Hort. Sci.* 24, 1948 (72-105). [Long Ashton Res. Sta., Bristol]

A rapid chemical tissue-test method is described, designed to determine the mineral status of field crops, that has been used to diagnose deficiencies of K, Mg, P, N and Mn in potatoes and cauliflower grown in a long-term manurial trial. The data reflect the effects of manurial treatment and show differences in nutrient status of different

crops grown on the same plot. Results show good agreement with visual diagnosis, and it is possible to fix threshold values at which deficiency of K, Mg, P and N produce visual symptoms in a number of crops. A close correlation was found between data of tissue tests and those of full chemical analysis. At high nutrient levels in healthy plants the tissue-test method did not always distinguish the differences shown by full analysis. The tissue-test method may replace the time-consuming process of ash analysis for rapid diagnostic purposes.

[433] 631.427.3
NICHOLAS, D. J. D. **The application of rapid chemical tests to the diagnosis of mineral deficiencies in horticultural crops. II. Crops grown at various centres.** *J. Hort. Sci.* 24, 1948 (106-122). [Long Ashton Res. Sta., Bristol]

That rapid chemical tissue tests are of particular value when visual symptoms are difficult to interpret was demonstrated in the following complex nutritional disorders: (a) acidity complex in potato when K, Mg, Ca, P and N deficiencies and Mn toxicity occurred together; (b) K deficiency and Cl toxicity in black and red currant; (c) K and Mg deficiencies in apples.

[434] 631.427.3
SHEAR, C. B.; CRANE, H. L.; MYERS, A. T. **Nutrient-element balance: application of the concept to the interpretation of foliar analysis.** *Proc. Amer. Soc. Hort. Sci.* 51, 1948 (319-326). [Pl. Indust. Sta. Beltsville, Md.]

Complete leaf analysis alone cannot give the whole picture of the nutritional status of the plant; this status will differ for each crop. A symptom typical of a deficiency of a certain element does not necessarily mean that a low level of that element is responsible for the symptom, for example, in an experiment on the influence of Mg on B nutrition, leaf analyses showed no relationship between Mg or B content and the B-toxicity symptoms, but the severity of the symptoms was closely correlated with the Mg:B ratio. Further research is needed before the nutrient-element-balance interpretation of foliar analysis can be satisfactorily applied to controlling the supply of nutrients to different crops.

[435] 631.427.4 : 631.423.3
LONG, O. H. **A comparison of two soil-test methods as correlated with wheat and cotton response to fertilizers.** *Proc. Soil Sci. Soc. Amer. 1947*, 12, 1948 (255-261). [Tenn. Agric. Expt. Sta.]

A biological method, using *Cunninghamella blakesleeana* and *Aspergillus niger*, was compared with a chemical extraction method using $NaClO_4$ in 0.1 n. $HClO_4$ for estimating available P and K. Results were correlated with response of wheat and cotton to various fertilizer treatments. Wide discrepancies occurred in the values for available P that ranged from 10 to 111 lb./acre by the biological and from 0.3 to 0.9 lb./acre by the chemical method. These values however should be considered as indices rather than as absolute amounts. With a few exceptions, determination by both methods correlated satisfactorily with crop responses. A response with wheat might reasonably be expected up to levels of 45 and 4.5 lb. of P per acre, and with cotton up to levels of 70 and 7.0 lb. of P per acre, by the biological and chemical methods respectively. Available-K values were of the same magnitudes by both methods and in none of the fields was the K supply critically low. The response of wheat to K was insignificant and that of cotton variable; discrepancies in the degree of response were apparent. K response, however, may depend on certain physical properties of the soil, such as internal drainage.

Although one soil test was not distinctly superior to the other, the chemical method was much more rapid; the need for a method permitting a more accurate prediction of crop response to fertilizers was indicated particularly in the case of K.

631.43 SOIL PHYSICS

(*See also* Abs. Nos. 377, 430, 476, 492, 520, 709)

[436] 631.43
LEIBOVICH, H. **Soil properties computed by nomograph.** *Engng. News-Rec.* 141, No. 12, 1948 (108-109). C.A. 42 (9020).

A nomograph is described for calculating from the results of a few laboratory measurements the properties of soils with specific gravity of 2.3-3.2 and water contents of 5.5-40%. Similar charts can be prepared for other soils.

[437] 631.43 : 546.411.31
YODER, E. J. **The effect of calcium chloride on the compactive effort and water-retention characteristics of soils.** *Proc. Highway Res. Bd. Wash.* 27, 1947 (490-509). C.A. 42 (8389). [Purdue Univ. Lafayette, Indiana]

The pH of soil-$CaCl_2$ mixtures is less than that of the same soils without $CaCl_2$. $CaCl_2$ lowers both the liquid and plastic limits of some of the soils. The results of drying and re-wetting tests showed that the moisture content of the specimens containing $CaCl_2$ were lower after the drying and wetting cycle than those without $CaCl_2$.

[438] 631.43 : 620.155
EVANS, I.; SHERRATT, G. G. **A simple and convenient instrument for measuring the shearing resistance of clay soils.** *J. Sci. Instrum.* 25, 1948 (411-414). [Army Op. Res. Group, War Office]

The instrument, which is known as a "Vane", comprises a system of vanes at the end of a rod which is inserted into the soil. A torque is applied to the vanes by means of a torsion spring and gradually increased until shear failure takes place in the soil. The theory accounting for torque in terms of cohesion and angle of internal friction agrees with experiment for angles up to at least 10°.

[439] 631.432 : 551.46.018.5
KACHINSKY, N. A. [**A new type of simplified bathometer.**] *Pochvovedenie* 1948 (786-787). [R.]

A simple apparatus for taking samples of water at a given depth in narrow crevices is described as being particularly suitable to enable soil scientists to sample ground waters.

[440] 631.432 : 551.49
FROST, W. T.; WORK, R.A. **The use of snow survey data for agricultural planning.** *Agric. Engng.* 29, 1948 (490-492, 494).

More than 75% of the irrigation-water supply of the Western States originates as snow on mountain watersheds. In the winter of 1947/48, about 1,000 men from 180 cooperating agencies made 2,300 snow surveys on 950 snow courses in 12 States and in British Columbia. A survey consists of 10 to 12 samples of the snowpack, taken at intervals of 50-100 feet over a permanent course. Depth and water content are measured on the spot. Reliable forecasts of seasonal water supply in the various basins are developed by the Soil Conservation Service, and have permitted timely curtailment or expansion of crop acreages, the elimination, if necessary, of longer-season or late-maturing crops from the year's programme, thinning-out of orchard fruits and early discing-under of cover crops and the strengthening in advance of dykes against flooding.

[441] 631.432.2
HILGEMAN, R. H. **Changes in soil moisture in the top eight feet of a bare soil during twenty-two months after wetting.** *J. Amer. Soc. Agron.* 40, 1948 (919-925). [U.D. Date Garden, Indio, Calif.]

The total loss of water was 9.8 inches or 47% of the water available for plant growth at the beginning of the experiment. Statistically significant losses were found in the top 8 feet of soil, with the largest losses occurring at 2-4 feet below the surface. Below 2 feet the amount of loss became less with increasing depth. The rate of loss decreased with time as the moisture content of the soil approached the wilting point.

Tension measurements were made in an experiment when soil dried to wilting point was wetted and the changes in soil moistures recorded for 60 days. A downward movement of water took place during the period. Soil-moisture values associated with field capacity were found 10, 14 and 19 days after wetting at depths of 0-12, 12-18 and 18-30 inches respectively. Changes in tension were correlated with soil-moisture changes at depths of 36 and 48 inches but not at 60 inches. Approximately 1.3 inches or 10% of the total available water in the soil 5 days after irrigating was not present 55 days later. This loss which extended to a depth of 54 inches, is attributed to evaporation.

[442] 631.432.2
PENMAN, H. L. **Physics in agriculture.** *J. Sci. Instrum.* 25, 1948 (425-432). [Rothamsted]

Present knowledge of the nature of the relationship between soil and its moisture content is outlined. pF and the pF curve are discussed, and from the theoretical argument and experimental evidence the working rule is obtained that "except at or near field

capacity, the water in the soil stays where it is": cultivation is thus not a water-conserving operation, but a method of weed control. Evaporation from saturated surfaces is treated in terms of sink strength and energy balance; the evaporation from open water may be estimated from air data and from this the water requirement of a freely-transpiring vegetable cover may be estimated. The calculation will not apply to the stage at which the water supply from soil to roots is too slow to sustain the maximum transpiration rate; a possible method of overcoming this limitation involves regarding the plant as (a) transpiring at the maximum rate a total of "C" inches, varying with the kind of plant and with the spring rainfall, and beyond this (b) as transmitting a drying potential to the bottom of the root zone; the subsequent removal of water would be much the same as if the same potential were applied directly to bare soil. As empirical data exist, connecting the drying rate for bare soil with the drying potential, it is possible to draw up a composite curve to cover both processes and with it to follow seasonal changes in soil moisture entirely from weather data.

Weather estimates of evaporation can be of use in hydrology: the annual open-water evaporation losses of a number of catchments, when estimated from meteorological data, were approximately equal to the corresponding figures obtained through rainfall and run-off data from the records of catchment boards.

[443] 631.432.2 : 634.9

MAŘAN, B. Vliv podrostu na vlhkost lesni půdy. **[The effect of undergrowth on forest-soil moisture.]** *Zprávy Stát. Výzkum. Ustavů Lesn. ČSR. Ročen.* 1947 (55-77). [Cz.e.r.]

Soil moisture varied considerably with the season. In general in winter and spring the soil was more moist where there was no undergrowth. In summer there was more moisture where the undergrowth was thick, irrespective of the kind of tree. At critical periods when soil moisture is of importance the undergrowth has a favourable effect, and this was of particular importance in dry and warm regions. With undergrowth the upper three horizons, the eluvial and the illuvial horizons had a higher moisture content than in plantations without any undergrowth. Deciduous undergrowth affected the soil moisture more than coniferous undergrowth.

[444] 631.432.21

PENMAN, H. L. **Natural evaporation from open water, bare soil and grass.** *Proc. Roy. Soc.* 193A, 1948 (120-145). [Rothamsted]

Two theoretical approaches to evaporation from saturated surfaces, based on aerodynamic and energy bases, have been combined so as to permit theoretical estimates of evaporation rates to be made from meteorological data. The Rothamsted meteorological experimental site is described, and evaporation data from water, soil and turf are presented and discussed. Evaporation rate from continuous wet bare soil is 0.9 times that from an open-water surface exposed to the same weather conditions. Evaporation from turf varies with the season from 0.6 in midwinter to 0.8 in midsummer. The experimental results are applied to data published elsewhere and it is shown that a satisfactory account can be given of open-water evaporation at sites in America and Europe; the results for bare soil receive a reasonable check in India and application of the results for turf agrees with estimates from catchment areas in the British Isles.

[445] 631.432.21 : 551.577

TRUMBLE, H. C. **Rainfall, evaporation and drought-frequency in South Australia.** *J. Dept. Agric. S. Aust.* 52, 1948 (55-64 and Suppl. 15 pp.).

Studies of evaporation from soil indicate that, over the time between wetting by rain and drying, the top 4 inches tend to lose $\frac{1}{5}$-$\frac{1}{2}$ of the moisture which evaporates from a water surface as exposed in the standard Australian evaporimeter. The ratio is highest at a low rate of loss and lowest when the rate of evaporation is high. The mean evaporimeter losses and the mean period of effective rainfall have been determined for 206 stations in South Australia and since 1936 these values have been used to assess the rainfall characteristics of the State as a whole. Expectancies of wet periods, characteristics of different regions, root penetration and plant production and reserves of soil moisture are discussed. Deep-rooted perennials like lucerne and phalaris are frequently able to survive dry periods and to make growth on the moisture held in the lower depths of the soil and subsoil.

Tables show rainfall, average length of the growing season for surface-rooted annuals, probability of receiving effective rainfall or a season of drought, and air temperatures for the coldest month.

[446] 631.434

TAMHANE, R. V. **Crumb structure as an important factor in soil erosion.** *Indian Farm.* 8, 1947 (83-85). [Agric. Res. Inst. New Delhi]

To obtain crumb structure, a soil must have enough colloidal material to bind the particles together; and sufficient organic matter and lime. The soil must be cultivated at the proper moisture content.

[447] 631.434

GELTSER, F. YU. **[What determines the stability of soil structure ?]** *Sovet. Agron.* No. 11, 1948 (69-76). [R.]

Stability of soil structure is determined by the amount of stable aggregates accumulated during the life time of perennial grasses. If the soil contains only 20-30% of stable aggregates stability will soon be lost after the grass has been ploughed up. When 50-90% of stable aggregates are present in the soil before ploughing up, a stable structure is likely to last during the whole rotation. In ploughing up different soil types the least destruction of stability occurred on a deep chernozem which, under permanent grassland, contained 74% of stable aggregates. Even in serozems with the turf process of soil formation, i.e. with grass grown under irrigation, 78.9% of stable aggregates were found under *Andropogon ischemum*. The reason for the instability of structure in serozems is not the lack of a colloidal fraction or the hot climate, but the lack of a lengthy turf process of soil formation. The poor structure-forming capacity of the coarse root system of lucerne also contributes. An important factor in the accumulation of stable soil aggregates is the formation of a good root system in grass and forage crops. Experimental results show that the main cementing agents in soil are the colloidal products of bacteria.

[448] 631.434 : 631.432.3

BAEYENS, J. ; CANNIÈRE, J. DE. Détermination de la structure des sols au moyen de la perméabilité. **[Determination of soil structure by means of permeability.]** *Agricultura* 45, 1947 (105-136). [F.e.g.]

A new method and apparatus are described for determining soil permeability. Experiments show a fairly close connexion between permeability and structure in soils flooded by sea water and reclaimed by the application of NaCl, gypsum, $CaCl_2$ and lime. Permeability is greater in the surface soil than in the subsoil.

[449] 631.434 : 631.445.7

DUTHIE, D. W. **Soil science : Report for the year 1947.** *E. Afric. Agric. Res. Inst. Amani Rept. 1947,* 1949 (5).

During preliminary observations on the structure of soil crumbs, a technique was worked out whereby even loosely knit crumbs can be hardened in Canada Balsam, ground to a flat polished surface and examined under the microscope with reflected light. There seems to be a peculiar regularity in the structure of crumbs, even in widely differing soils ; a common pattern consists of quartz crystals embedded in a fine-grained matrix. The regular distribution of particles of different sizes suggests that very little binding material, such as organic matter, may be necessary and physical stability may be a major factor in crumb formation. It is possible, however, that a colourless form of soil-organic matter plays some part in crumb formation. When a crumb of red earth that showed no sign of organic matter under reflected light was heated gently in order to char any organic compounds, all the aggregates were covered with a black deposit which disappeared on stronger heating. The presence of uncoloured organic substances in soil may explain the fact that some tropical soils contain more organic matter than is reflected by the soil colour.

[450] 631.434 : 631.452

RUSCHMANN, G. Bodengesundung durch Verbesserung des Bodengefüges. **[Soil health through improvement of structure.]** *Landw. Jahrb.* 93, 1944 (509-521). [G.e.f.i.sp.] [Landsberg, Warthe]

A discussion concerning the way in which mechanical and chemical analyses of soil profiles can help in deciding on the cultivational or other measures required or to be avoided in improving a soil.

The mechanical composition of several soil profiles is expressed in diagrams showing

the volume percentages of the solid particles, water, air and capillary and non-capillary pore-spaces. The volumes of solids, pore-spaces and water should be roughly in the proportion 2 : 1 : 1. In Germany more than 60% of all soils show compaction, the elimination of which should increase average yields by 20% and provide a return of 4 or 5 times the outlay.

[451] 631.434 : 631.46
SWABY, R. J. **Micro-organisms and soil structure.** *J. Gen. Microbiol.* 2, 1948 (xviii).

In pure-culture studies it was found that the aggregating power of micro-organisms was :—fungi > actinomycetes > capsulated and gum-producing bacteria > yeasts > non-capsulated bacteria. Most bacteria had no effect on soil aggregation. Mixed inocula of fungi or actinomycetes gave slightly better aggregation than pure cultures, but mixtures either of capsulated or of non-capsulated bacteria gave no better results than single strains. Few crumbs were formed if the mixture contained bacteria which inhibited the growth of either the fungi or actinomycetes.

[452] 631.434 : 631.461
MISHUSTIN, E. N. ; GROMYKO, E. P. **Stability of soil macroaggregates formed by microorganisms.** *Mikrobiologia* 15, 1946 (169-175). C.A. 42 (9030).

Bacterial slimes and fungal mycelia take part in aggregating soil particles, but micro-organisms also act to break down the aggregates. The disaggregating action varies widely according to conditions ; in general 30-90% of the aggregates are broken down in 30 days. Aggregates formed with bacterial slimes are readily susceptible to bacterial breakdown, but are stabilized by toluene. Stabilization by toluene is much weaker in aggregates formed with mycelial substances.

[453] 631.434 : 633.2.03
TSYGANOV, M. S. **[Perennial herbage as a restorer of soil structure.]** *Pochvovedenie* 1948 (561-568). [R.]

Aggregate analyses made on a weakly alkaline chernozem loam which had previously grown wheat continuously indicated that grasses and legumes had a positive effect on crumb structure. The proportions of the coarse (> 5 mm.) and the dispersed fractions decreased and the crumb fractions increased. Growth of herbage also increased the water stability of the crumbs. Different grasses had their maximum effects after different periods of time. Rapidly growing brome grass was an excellent structure former even in its first year. *Agropyron tenerum* had its maximum effect in its second year and *A. cristatum* in its third year. Legumes are not, in general, such good structure formers as grasses, but they fix N, and therefore a mixture of grasses and legumes is a better producer of soil fertility than either singly.

[454] 631.436 : 631.432.2
DIMO, V. N. **[The relation between temperature conductivity and soil moisture.]** *Pochvovedenie* 1948 (729-733). [R.]

Experiments were made with quartz sand and field soils, and it was shown that the results with sand were not comparable with those obtained with natural soils. The temperature conductivity of a medium podzolized soil increased in all three horizons from the absolutely dry to the capillarily saturated state, and was also affected by soil density. In a weakly solonetsous chernozem the maximum-temperature conductivity was related to hygroscopic moisture. These observations were made on laboratory samples, and it is stated that the results may not be applicable to undisturbed soils.

[455] 631.436 : 631.432.2
SWINBANK, W. C. **Note on the direct measurement of the thermal conductivity of soil.** *Quart. J. Roy. Met. Soc.* 74, 1948 (409-410).

The transfer of water vapour in the soil, probably in the direction of the temperature gradient, results in condensation within the soil of very small amounts of water that would liberate sufficient latent heat to mask completely the transfer of sensible heat due to the temperature gradient. It cannot be assumed that a thermometric conductivity is constant even over short periods.

[456] 631.436 : 634.9
SAKHAROV, M. I. **[Dependence of the temperature regime of the soil on the character of the forest cover.]** *Pochvovedenie* 1948 (157-166). For. Abs. 10 (164). [R.] [Beloruss. Lesotekh. Inst.]

Hitherto unpublished observations made in 1911-13 in the Bryansk Experimental Forest are discussed. The soil was medium-podzolized sandy soil with no iron pan and the vegetation of 3 types, (1) stands of reed grass (*Calamagrostis epigeios*) on a cleared area, (2) a 90-year-old single-storeyed Scots pine forest (*Vaccinium vitis-idaea* type), and (3) a pine forest of the same type and age but with a second storey of Norway spruce. The mean annual temperature and mean annual maxima at the soil surface were respectively 2.3° and 6.0°C. higher in (1) and 0.8° and 2.1° higher in (2) than in (3). The absolute maxima were 52.3° for (1), 41.3° for (2) and 31.5° for (3). The mean annual minima in (1) and (2) were respectively 3.1° and 0.8° lower than in (3). The absolute minima were —38.3°, —28.5° and —26.5° and the number of days with temperatures below 0° were 193, 167 and 155 respectively. The mean annual soil temperatures at depths down to 2 m. were 1.7-2.4° higher in (1) and 0.6-1.2° higher in (2) than in (3).

631.44 SOIL TYPES

(*See also* Abs. Nos. 372, 449, 473, 506, 766)

[457] 631.445
SPIRHANZL, J. Novodobý regionální výzkum půd s hlediska zemědělského. **[Contemporary regional soil research from the agricultural point of view.]** *Sborn. Výzkum. Ustavů Zeměd.* 173, No. 20, 1948 (13-36). [Cz.]

A discussion of climatic soil types.

[458] 631.445 : 551.432
GERASIMOV, I. P. **[Soil types of mountainous countries and vertical soil zonality.]** *Pochvovedenie* 1948 (661-669). [R.]

Specific soil types occur in mountains, as well as types that are also found in plains. A typical soil of the mountainous regions of Dagestan, Armenia and Tadzhikistan is the brown soil of dry woods and scrub land. The profile consists of a grey-brown humus horizon, a brown heavy-clay subhumus horizon with a nutty-clod structure, and a horizon of carbonate accumulation. The soils are neutral, appreciably leached with an accumulation of a clay fraction in the upper and middle parts of the profile with a tendency towards a loss of SiO_2 and an accumulation of R_2O_3 throughout the whole soil as compared with the parent rock. Thus the soils are distinct from brown forest or dark (leached) serozems and the mountain-chestnut soils with which they have been identified in soil literature.

Further discussion is concerned with the purely geographical aspect of mountain-soil science. Vertical soil zones in each mountainous region depend on the type of country at the foot of the mountains. In the desert-steppe belt for instance the vertical zones begin with foothill deserts and steppes which are succeeded by mountain-forest soils and end usually with mountain-pasture soils. In the boreal belt the vertical zones commence with mountain-forest soils and end with mountain-tundra soils.

[459] 631.445 : 551.432
SHCHERBAK, F. I. **[Zonal elements in the soil cover of Circassia.]** *Pochvovedenie* 1948 (698-704). [R.]

The zonal sequence from the plain to the Circassian mountains is firstly the pre-Caucasian chernozems, followed by the pre-mountain chernozems, mountain-forest and mountain-meadow soils intermixed with humus-carbonate soils. The profiles of the different zonal soils are described and analytical data are given for some of them.

[460] 631.445.2 : 631.435
KOVRIGIN, S. A. **[Genetical peculiarities of the mechanical composition of soils on the deep sand deposits of the forest-clad terraces of the river Viatka.]** *Pochvovedenie* 1948 (167-176). [R.]

The soils are more or less strongly podzolized, the degree of podzolization varying with the type of forest. In soils derived from clay parent materials fine particles (<.01 mm.) are leached from the surface horizons. Soils derived from quartz sands contain the highest quantity of fine particles in the surface, the quantity decreasing with depth. In strongly podzolized (sandy) soils the fine fraction is leached from the A into the B horizon.

[461] 631.445.4 : 631.48
VOLOBUEV, V. R. **[Coalesced chernozems.]** *Pochvovedenie* 1948 (670-677). [R.]

"Coalesced" chernozems, which occur in the foothills of the Western Caucasus, are dark-coloured, neutral soils differing from normal chernozems by the absence of a granular structure and by their great impermeability and compactness which make them difficult to cultivate and impassable as roads in wet weather. They are characterized by a loss of absorbed bases together with a certain desaturation and destruction of the absorbing complex, accompanied by translocation and accumulation of Fe, a high content of clay fractions of <0.001 mm., considerable "liberation" of colloids, and disintegration of secondary aggregates.

[462] 631.445.6 : 631.48
GÈZE, B. Paléo-sols et sols dus à l'évolution actuelle. **[Paleo-soils and soils due to current evolution.]** *C.R. Conf. Pédol. Méditerr. 1947,* 1948 (140-156). [F.] [Montpellier]

Geological evidence is adduced which leads, in the author's opinion, to the conclusion that the terra rossas of the south of France are the product not of the contemporary Mediterranean type of climate, but of an earlier humid tropical climate. The soils are essentially sedimentary or residual lateritic formations occurring on the surface of post-tectonic peneplains. It is suggested that contemporary soil formation is of the brown-earth type.

[463] 631.445.72
PATWARDHAN, N. K. **Need for soil stabilisation.** *J. Sci. Indust. Res. (India)* 7A, 1948 (227-229). B.A.BIII, 1948 (349).

The chief types of Indian soil are the black cotton soil of the Deccan and the Indo-Ganges alluvium. During the rains the black cotton soil swells and softens, but hardens in summer and develops cracks 5-8 feet deep and 5-100 feet long. The alluvium does not crack but is light and erodes easily.

631.459 SOIL EROSION

(*See also* Abs. Nos. 712, 767, 777, 778, 780)

[464] 631.459 : 627.51
DEPPA, J. W. **The formation and control of arroyos in the Southwest.** *J. Forestry* 46, 1948 (174-179). [S.C.S.]

Arroyos have arisen in grassed waterways where flash-flood waters from adjoining hills deposited silt among the grass roots thereby building up the valley floor. Overgrazing however has destroyed the stability of these valleys and with misuse of the watersheds has resulted in arroyo formation. An arroyo may be divided into five sectors: 1, a relatively straight channel; 2, the advancing bar; 3, a sector where cutting occurs laterally on the outside of the curve; 4, an inner bar opposite the cutting sector; and 5, a receding bar. The destructive power of the stream does most damage in sector 3, where the flood action eats into the bank and adjoining fields. Here the stream velocity drops slightly resulting in a deposition of debris in the backwater between sectors 2 and 3. Growth of the silt bar thus formed is important in efficient arroyo control and its maintenance should be ensured by suitable structures or heavy planting of willow, baccharis or other sucker-forming plants. Although sector 5 superficially resembles sector 2 when dry, the forces acting on it are in the opposite direction and planting here would speed up the cutting of the outside curves and serve no useful purpose. It is concluded that, after securing watershed control to reduce extreme flood crests, arroyo-curve migration may be stopped and the entire arroyo stabilized provided that bank protection immediately below the cutting curve could be developed in advance to resist stream forces moving into the area, and that the advancing bar just above the curve could be induced to travel downstream across the cutting sector to join the receding bar. Finally, the roughness of the entire channel should be increased by continuous plantings and simple retardants to secure a general reduction of velocity and the deposition of sediments.

[465] 631.459 : 627.51
LULL, H. W. **Watershed condition and flood potential.** *J. Forestry* 47, 1949 (45-48). [Forest and Range Expt. Sta., Ogden, Utah]

The gullied area of a catchment basin was divided into 3 condition classes, using plant density and extent of visible erosion as class criteria. The flood potential of these condition classes was determined by subjecting plots of land to heavy artificial rainstorms and measuring the run-off rate

and areal discharge. It was found that class-I land (least eroded), occupying 31% of the area, accounted for 4% of the discharge, class-II land (53% of the area) for 48%, and class-III land (16% of the area) also for 48%. This kind of classification makes it possible to estimate the extent of measures necessary to prevent destructive storm run-off.

[466] 631.459 : 627.51 : 631.589
RYCROFT, H. B. **A note on the immediate effects of veld burning on stormflow in a Jonkershoek stream catchment.** *J.S. Afric. Forestry Assoc.* 15, 1947 (80-88). For. Abs. 10 (166).

An investigation into the effect of autumnal veld burning on stream behaviour in a Jonkershoek stream catchment showed that during the winter following the fire there was a highly significant increase in the rate of stormflow, a rise in flood heights, an increase in the volume of stormflow and an increase in stream discharge. These conclusions indicate that there is a serious danger of flooding and erosion if the protective vegetation is removed by late autumn burning.—Author's Summary.

[467] 631.459 : 631.61
BROWNING, G. M.; NORTON, R. A.; MCCALL, A. G., ET AL. **Investigation in erosion control and the reclamation of eroded land at the Missouri Valley Loess Conservation Experiment Station, Clarinda, Iowa, 1931-42.** *U.S.D.A. Tech. Bull.* 959, 1948, pp. 88.

The distribution of loess soils in Iowa, Nebraska, Missouri and Kansas is described. More than 50% of the original A horizon has been lost by sheet and gully erosion. The practice has been to plough in the small gullies when the seed bed is prepared, but this leads to even greater soil losses and more rapid gully formation as the loose soil is readily washed out by run-off water. Total rainfall intensity, duration and frequency are being measured and experiments have been laid down to determine (a) the amount of water vapour lost as evaporation from the soil and transpiration from plants, and (b) the factors that affect density of runoff or the amount of soil carried in a given quantity of water; these include crop cover, type and character of root development, soil, slope and rainfall characteristics. Lysimeter measurements of percolate, runoff and erosion show that the annual application of 16 tons/acre of manure to fallow land increased the percolate from 4.5 to 7.3 inches and reduced runoff from 8.5 to 7.0 inches. Accompanying the reduction in runoff there has been an even greater reduction in soil losses of from 15.4 to 12.1 tons/acre. The reduction in runoff and erosion in maize is greater than in fallow soils. The manure increases soil porosity through increased aggregation of the surface soil, produces a more vigorous plant which permits more effective interception of rainfall and a more vigorous root system which binds the soil particles together.

Soil moisture and infiltration, strip cropping, cover crops, terraces, small watersheds, the effect of cropping systems on organic matter and aggregation are discussed.

[468] 631.459 : 631.61 : 34
FOOD AND AGRICULTURE ORGANIZATION. **Soil Conservation Laws. I. United States of America: A Standard State Soil Conservation Districts Law, 1936. II. Union of South Africa: Act to Make Better Provision for the Combating and Prevention of Soil Erosion, 1946. III. Western Australia: Soil Conservation, an Act Relating to the Conservation of Soil Resources and to the Mitigation of Erosion, 1945.** *F.A.O. Washington*, 1948, pp. 22.

[469] 631.459 : 631.81
CUMMINGS, R. W. **The role of commercial fertilizer in soil conservation.** *Amer. Fert.* 109, No. 8, 1948 (7-8, 26, 28). [N.C. Agric. Expt. Sta.]

Where nutrients have been leached from the soil the use of commercial fertilizers is essential for satisfactory crop production, but to develop a permanent agricultural system providing for adequate soil conservation the right combination of crop selection, soil management and fertilizing must be used. This fact is illustrated by experiments on a catchment consisting of severely eroded, abandoned crop land in which quality of sod and ground cover was improved, infiltration rates increased and soil loss eliminated by the use of fertilizers and suitable cropping. Experiments are also quoted to demonstrate

the favourable effect of commercial fertilizers on soil organic matter, and on the fertility and productivity conservation of the flatter lands subject to intensive systems of cropping.

[470] 631.459 : 631.81
PRESNIAKOVA, G. A. **[The influence of the degree of erosion of soils on the yield of agricultural crops in the podzol zone.]** *Pochvovedenie* 1948 (539-552). [R.]

Experiments were made with soils at different stages of erosion in the field under natural conditions and in pots so as to eliminate the influence of slope, exposition and other uncontrollable variables. The effect of erosion on the physical and chemical properties of the soil varied with the degree of erosion, slight erosion resulting in the incorporation of the A_2 horizon in the cultivated layer, and severe erosion in the incorporation of the B horizon. Very poor yields of very poor cereal plants were obtained from eroded soils, no fertilizers being added in the field experiments. In pot experiments similar low yields were obtained without fertilizers. Addition of NK increased yields from uneroded but not from eroded soil. NP increased yields also from eroded soils. NPK raised the yields from both eroded and uneroded soils to approximately the same level.

[471] 631.459 : 634.989.84
ROCKY MOUNTAINS FOREST RANGE EXPERIMENT STATION. **Effect on run-off and erosion of removing forest litter.** *Rocky Mt. For. Range Expt. Sta. Rept. 1947*, 1948 (26-27). For. Abs. 10 (166).

Six $\frac{1}{100}$-acre plots were laid out in a dense stand of second-growth Ponderosa pine with a slight mixture of aspen. All litter and duff was removed from the surface of 3 of these plots in June 1941, care being taken not to disturb the humus layer of any living plants, as the effect of the undecomposed material alone was to be evaluated. The equivalent of 20 tons of organic material per acre was removed. The other 3 plots were left undisturbed. During the 7 years following this treatment, litter was allowed to accumulate, with a consequent gradual reduction in the effects of removal. During the first 15 months surface run-off was more than doubled, and erosion was increased about 72 times. Thereafter both run-off and erosion decreased because of re-accumulation of litter.

631.46 SOIL MICROBIOLOGY

(*See also* Abs. Nos. 405, 452, 561, 566, 715, 719)

[472] 631.46 : 576.809.7
THORNTON, H. G.; BRIAN, P. W. **Microbial association in soil: production of antibiotics in relation to the ecology of soil-inhabiting micro-organisms.** *J. Gen. Microbiol.* 2, 1948 (xvii).

The commoner species among the protozoa, bacteria, actinomycetes and fungi of the soil have a wide distribution and constancy of occurrence and many of them are capable of producing antibiotic substances in artificial culture. In many cases of antagonism between saprophytic soil organisms and soil-borne plant-pathogenic fungi the observed facts can be explained by assuming the production of antibiotics which suppress the multiplication or metabolic activity of the pathogen. Although there is no strong evidence that organisms capable of producing antibiotics in pure culture can do so in soil, there are some indications that such substances are produced under certain conditions.

[473] 631.46 : 631.445.5
NOVOGRUDSKY, D. M. **[Microbiological processes in semidesert soils. I. Soil micro-organisms and hygroscopic soil moisture. II. Minimum soil moisture requirements to maintain bacterial life.]** *Mikrobiologia* 15, 1946 (177-186, 479-483). C.A. 42 (9030).

When soil moisture is above maximum hygroscopicity the organisms (e.g., *Penicillium* and actinomycetes) grow and form microcolonies. Soil bacteria surround soil particles or fungal hyphae with a bacterial film and thus penetrate the soil along with the hyphae.

[474] 631.461 : 576.809.7
WAKSMAN, S. A. **Antibiotics.** *Biol. Rev.* 23, 1948 (452-487). [N.J. Agric. Expt. Sta.]

Review, with approximately 80 references.

[475] 631.461 :581.144.2
KATZNELSON, H.; LOCHHEAD, A. G.; TIMONIN, M. I. **Soil micro-organisms and the rhizosphere.** *Bot. Rev.* 14, 1948 (543-587). [Dept. Agric. Ottawa]

The subject is reviewed from the points of view of methods of study, effects of higher plants on soil micro-organisms and other microbiological phenomena associated with plant roots.

[476] 631.461 : 631.435
NOVOGRUDSKY, D. M. **[Influence of soil-particle size on distribution of soil micro-organisms.]** *Mikrobiologia* 16, 1947 (147-153). C.A. 42 (9030). [R.]

At 100-250 μ to 10 μ in the top layers of soil, the percentage of populated particles ranged from 100 to 0.2. For fungi and actinomycetes the percentage figures were 35-40 to 0.2. Hence pulverization of soil is unfavourable to soil microflora. At greater depths the percentage of populated particles decreases, for example, from 100 at 0-23 cm. to 38 at 117-180 cm. for aerobic bacteria in the particle-size range 100-250 μ.

[477] 631.461 : 631.445.15
STÖCKLI, A. Über den Bakteriengehalt alpiner Böden. **[The bacterial content of alpine soils.]** *Landw. Jahrb. Schweiz* 62, 1948 (1-19). [G.f.]

The effect on soil-bacterial content of soil pH and the quantity and type of soil-organic matter was investigated in about 300 soil samples from altitudes of 1600-2300 m. in various parts of Switzerland. The samples differed widely in pH, organic-matter content, agricultural use, cultivation and fertilizing. Soil pH was less important than is usually supposed; soils of pH down to 3.2 contained quite large quantities of bacteria, and a number of common bacteria were found in very acid forest soils: the low count in very acid raw-humus and highmoor soils thus depends less on the pH than on the nature of their organic content. The organic substance of humus-rich soils usually contained fewer bacteria per unit weight than soils poor in humus. The numbers of bacteria per unit weight of the organic substance of different soils increased in the following order: spruce, pine, highmoor, pasture, arable, meadow and garden soils and also increased with depth in the profile. It is stressed that comparison of the bacterial content of whole soils should be carried out on a volume and not a weight basis.

[478] 631.461 : 631.467.1
ANSCOMBE, F. J.; SINGH, B. N. **Limitation of bacteria by micro-predators in soil.** *Nature* 161, 1948 (140-141). [Rothamsted]

Soil micro-predators are very selective in their bacterial food requirements. The comparative edibility of bacterial strains by micro-predators and their probable role in limiting the bacterial numbers in the soil are discussed.

[479] 631.461.51
FEDOROV, M. V. **[Significance of carbon-linked hydrogen in fixation of hydrogen by azotobacter.]** *Mikrobiologia* 17, 1948 (208-217). C.A. 42 (8393). [Timiriazev Acad., Moscow]

Utilization of O-linked H (e.g., from carbohydrates and polyhydric alcohols) differs from that of C-linked H (e.g., from saturated aliphatic acids) in fermentation by azotobacters. Thus 1 kg.-calorie of chemical energy fixes 2.1 mg. of N in glucose medium corresponding to 211 mg. of N per gm. of H. The energy efficiency of N fixation is the same as in fermenting glucose. This disproves the theory that only C-linked H participates in the H transitions of bacterial N fixation, so does the fact that *o*-dinitrobenzene acts as H acceptor in media containing no free oxygen (this permits 95% utilization of glucose H).

[480] 631.461.52 : 547.963.4
VIRTANEN, A. I.; JORMA, J.; LINKOLA, H., ET AL. **The relationship between nitrogen fixation and leghaemoglobin content of leguminous root nodules.** *Acta Chem. Scand.* 1, 1947 (90-111). Biol. Abs. 22 (1907). [Biochem. Inst., Helsinki]

Certain strains of legume bacteria were found to form nodules on the roots of the host plant, but the nodules did not fix N. Comparison between the nodules formed by these strains and those of effective strains showed that a red pigment, leghaemoglobin, was always present in the effective nodules. Leghaemoglobin has been purified to a degree that its iron content (0.29%) was the same as that of the haemoglobin of blood. A parallelism between the leghaemoglobin

content of pea nodules and their N-fixing ability seems to exist. A chronological description of the process of fixation is given.

[481] 631.461.52 : 547.963.4
SMITH, J. D. **The significance of haemoglobin in biological nitrogen fixation.** *J. Gen. Microbiol.* 2, 1948 (xxviii).

The distribution, localization and concentration of haemoglobin was studied. Support was lent to the hypothesis that the pigment is intimately concerned in the process of N fixation, but it was shown that nodule haemoglobin does not function as an oxidation-reduction catalyst.

[482] 631.461.61 : 576.809.7
SINGH, B. N. **Soil myxobacteria.** *J. Gen. Microbiol.* 2, 1948 (xvii-xviii).

The myxobacteria of soil and other substrates have been isolated and estimated. They are true soil inhabitants and range in number from 2000 to 76,000 per g. of soil. It has been shown that, on solid media, certain myxobacteria lyse living Gram-negative bacteria and a method of growing myxobacteria in mass-liquid culture to produce extra-cellular lytic secretions has been developed. A strain of *Myxococcus virescens* has been found to produce one substance which is a soluble, non-enzymatic antibiotic and another which is an exocellular proteolytic enzyme active against non-viable bacteria only.

[483] 631.461.71 : 631.445.52
VERNER, A. R.; ORLOVSKY, N. V. **[The role of sulphate-reducing bacteria in the salt regime of soils of Baraba.]** *Pochvovedenie* 1948 (553-560). [R.]

Sulphate-reducing bacteria were detected in saline soils and particularly in peaty and bog solonchaks where anaerobic conditions prevailed. Their activity was demonstrated by a decrease in the quantity of sulphate and an increase in the quantity of sulphide and bicarbonate in culture solutions inoculated with the soils. It is suggested that such bacteria may play an important role in the development of solonchaks and in the accumulation in them of soda.

[484] 631.466.1 : 576.809.7
GROSSBARD, E. **The production of an antibiotic substance in the soil which inhibits phytopathogenic organisms.** *J. Gen. Microbiol.* 2, 1948 (xix).

When *Penicillium patulum*, which is known to produce an antibiotic active against pathogens, was cultured on sterilized soil the aqueous extract did not inhibit the test organisms, but when grown on autoclaved straw or a mixture of sterilized soil, straw and water, an antibiotic was readily formed. Activity was increased by the addition of glucose; it is also reported that addition of carbohydrates to the soil reduces the virulence of certain diseases.

[485] 631.466.1 : 631.461.13
MISHUSTIN, E. N. **[Functions of sporogens in soil processes.]** *Mikrobiologia* 17, 1948 (201-207). C.A. 42 (8390). [Inst. Microbiol., Moscow]

Young soils not yet enriched with organic matter are much poorer in sporogens than are protein-rich composts. Relative abundance of sporogens increases with soil depth, as total bacterial count decreases. Late in mineralization, especially in forming compounds of N, P and K from organic matter, the relative activity of non-sporogens decreases while that of sporogens increases. Still later, when soil N is mainly inorganic, the sporogen activity again decreases.

[486] 631.466.2 : 576.809.7
LEBEN, C.; KEITT, G. W. **An antibiotic substance active against certain phytopathogens.** *Phytopath.* 38, 1948 (899-906). [Univ. Wisconsin]

The production, partial purification, properties and *in vitro* biological activity of an antibiotic produced by an unidentified strain of *Streptomyces*. The material, tentatively named antimycin, was in general more effective against fungi than bacteria; certain fungi pathogenic to human beings were inhibited as well as phytopathogens.

[487] 631.466.2 : 576.809.7 : 632.4
COOPER, W. E.; CHILTON, S. J. P. **Antibiosis of *Actinomyces* strains to *Pythium arrhenomanes*, *P. ultimum*, and *Rhizoctonia solani*.** Abs. in *Phytopath.* 39, 1949 (5).

Of 2452 cultures of *Actinomyces* from 42 soil samples 30% were antagonistic to at least one of the species *Pythium arrhenomanes*, *P. ultimum* and *Rhizoctonia solani*. At least 3 and probably more antibiotic substances were produced by the cultures tested. No correlation was observed between soil type and the occurrence of antibiotic strains.

[488] 631.467.1 : 551.482
GRAY, E. **The ciliate protozoan fauna of soil and inland waters.** *J. Gen. Microbiol.* 2, 1948 (xix-xx).

As a result of studying the bacteria and protozoa of a chalk stream and of the soil of the stream banks, it is suggested that there is a free exchange of organisms between the soil and inland waters.

631.468 MACROFAUNA. EARTHWORMS

[489] 631.468 : 634.9
HOFF, C. C. **Soil and soil invertebrates of aspen groves in the central Rocky Mountains.** Abs. in *Bull. Ecol. Soc. Amer.* 28, No. 4, 1947 (50). For. Abs. 20 (165).

In a study of 15 aspen groves and the bordering climax and sub-climax coniferous forests at 7,600-10,000 feet in Colorado and Wyoming, soil invertebrates were generally much more numerous in the aspen groves than in the coniferous forests. With one exception the soil from the aspen groves was slightly more alkaline and had a higher water content than soil from the coniferous forest.

[490] 631.468.516 : 631.452
CHADWICK, L. C.; BRADLEY, K. **An experimental study of the effects of certain earthworms on crop production.** *Proc. Amer. Soc. Hort. Sci.* 51, 1948 (552-562).

The effect of two types of earthworms on the growth of certain herbaceous and woody plants was investigated, and it was concluded that organic matter was more effective than earthworms in increasing soil porosity and aggregation. Earthworms were not superior to manure in changing the pH or increasing the availability of N, P, K or Ca content of the soil. There seems little point in adding earthworms to soil with a high content of organic matter.

[491] 631.468.516 : 631.452
FROUD, M. D. **Earthworms and soil fertility.** *Agric. Prog.* 23, 1948 (54-58). [Wye Coll., Univ. London]

In uncultivated soils, earthworms play an important part in the organic cycle, improving the physical condition of the soil and helping to form a fine humus layer at the surface. Under arable farming with cultivation by ploughing and the addition of fertilizers, earthworms probably have little influence in maintaining soil fertility.

[492] 631.468.516 : 631.452
HOPP, H.; SLATER, C. S. **Influence of earthworms on soil productivity.** *Soil Sci.* 66, 1948 (421-428). [S.C.S., U.S.D.A., Beltsville, Md.]

In an experiment to test whether earthworms can markedly influence soil productivity, the soil used was fine-textures, unproductive soil of poor structure. Where living earthworms were not introduced the vegetation was poor and even where manure, lime or fertilizer was added or the soil cultivated, the unfavourable conditions were not eliminated. Where living earthworms were introduced and favourable cover conditions maintained for the over-winter development of earthworms, the vegetation grew luxuriantly. Ants produced the same benefits as the earthworms and it is believed that improved soil structure resulting from the action of soil fauna may be a significant factor in soil productivity.

[493] 631.468.516 : 631.452
SHRIKHANDE, J. G.; PATHAK, A. N. **Earthworms and insects in relation to soil fertility.** *Curr. Sci.* 17, 1948 (327-328). [Agric. Coll. Kanpur]

Samples of soil from a plot containing the termite *Odontoterme*, anthills and earthworm casts were collected in August, the month of greatest rainfall. Analytical data show that the termites, ants and earthworms all increased the pH of the soil. The termits did not increase the availability of minerals but decreased the exchangeable bases with a serious decrease in lime and P. Ants are inferior to earthworms in increasing the availability of minerals. Organic matter was increased almost $3\frac{1}{2}$ times by earthworms, $1\frac{1}{2}$ times by ants and not at all by termites.

[494] 631.468.516 : 631.51
EVANS, A. C.; GUILD, W. J. M. **Studies on the relationships between earthworms and soil fertility. IV. On the life cycles of some British Lumbricidae.** *Ann. Appl. Biol.* 35, 1948 (471-484). [Rothamsted]

The rate of cocoon production differs considerably from species to species and is affected by soil temperature, moisture and food supply of the adult worms.

[495] 631.468.516 : 631.51
EVANS, A. C.; GUILD, W. J. M. **Studies on the relationships between earthworms and soil fertility. V. Field populations.** *Ann. Appl. Biol.* 35, 1948 (485-493). [Rothamsted]

The ploughing of a permanent pasture in spring was not followed by a reduction in earthworm population during the first 6 months, but further arable cultivation greatly reduced the population. 4-7-year-old leys carried a total population similar to that of permanent pastures, but the proportions of certain species were different. The population of a permanent pasture did not show appreciable change for nearly 3 years, but that of a ley in its first year following arable cultivation showed a significant increase.

631.47 SURVEYS. LAND USE

(*See also* Abs. No. 750)

[496] 631.47
EDELMAN, C. H. Landclassificatie. **[Land classification.]** *Landb. Tijdschr.* 60, 1948 (564-571). [Du.]

The five types of land classification as defined in "Land classification in the United States" (Nat. Res. Plann. Bd. 1941) are discussed in relation to the conditions in Holland and the requirements of Dutch agriculture. Several land-classification maps of the Netherlands following the American method are mentioned. It is concluded that land classification will be most useful to horticulture and small holdings which are the most intensive forms of land use and therefore ones that require the best soils.

[497] 631.47
GORSHENIN, K. P. **[The trend of soil-geographical studies.]** *Pochvovedenie* 1948 (534-538). [R.]

Soil-geographical research has been too theoretical in the past and has not concerned itself sufficiently with the solution of practical agricultural problems. In future not only must soil geographers realize that the ultimate object of their studies is the improvement of agriculture, but agriculturists must also realize the extent to which soil geographers can help them.

[498] 631.47 : 33
JACKS, G. V. **Land utilization, soil conservation and human ecology.** *Roy. Soc. Emp. Sci. Conf. Rept. 1946*, 2, 1948 (272-276).

The first stage of human occupation of land usually involves the destruction of the existing biotic equilibrium and a decline in soil fertility. This is followed by a stage in which society adapts itself to the environment, re-establishes a biotic equilibrium and increases the fertility of the soil.

The problem of soil conservation is to discover and bring into being conditions in which a stable equilibrium can exist between a human society utilizing the land for its maintenance, and the external environment. This requires a study of the relationships between different types of society and different types of environment.

631.48 SOIL FORMATION

[499] 631.48 : 577.2
POLYNOV, B. B. **[The role of the elements of the biosphere in the evolution of organisms.]** *Pochvovedenie* 1948 (594-607). [R.]

A hypothesis of the origin of life is advanced which maintains that the first organisms occurred "in conditions of primary orthoeluvium". These organisms were "prototrophic" and possessed the capacity of taking an active part in the decomposition of the mineral substrate and absorbed more or less indiscriminately a large number of the elements comprising the substrate. This capacity gave the organisms an adaptability to a great variety of conditions and enabled them to spread widely.

[500] 631.48 : 631.67
ROZANOV, A. N. **[Some peculiarities of cultural-irrigation deposits.]** *Pochvovedenie* 1948 (710-716). [R.]

Where irrigation results in the deposition of mineral matter two processes of soil formation take place simultaneously—from the underlying parent rock and from the deposited material. The nature of the deposited material varies greatly from place to place. Mineralogical analyses of the deposited material and of the parent rock will show whether irrigation is increasing or decreasing the potential fertility of the land.

[501] 631.482
Novikova, A. V. **[The regime and genesis of soils of the flood-plain of the river Don.]** *Pochvovedenie* 1948 (678-688). [R.]

The sequence of the formation of the flood-plain is discussed, the process of salinization and the water regime being considered in detail. The flood plain is divided into the three sections distinguished by W. R. Williams—that adjacent to the river bed, the central section and the section adjacent to the terrace. The evolution of these soils proceeds from fresh alluvium and meadow-swamp soils to turf-meadow soils. The turf-meadow soils become saline and evolve into solonchak-like and even into true solonchak soils. With the subsequent rise of the land and lowering of the ground water the soils become desalinized. Desalinization proceeds towards the formation of solods, while the biological accumulation of Ca and Mg produces chernozem-like soils. The most mature phase in the evolution of the Don flood-plain soils is represented by valley chernozems. The flood-plain soils, being neutral, give rise to colloidal materials of the montmorillonite type.

631.5 CULTURAL OPERATIONS

(*See also* Abs. Nos. 609, 692)

[502] 631.544.1/2
Ministry of Agriculture. **Crop production in frames and cloches.** *Min. Agric. Bull.* 65, 1948, pp. 51.

Subjects discussed include choice of site, soils, climate, shelter belts, irrigation, method of heating and soil-warming devices, production with continuous cloches and pests and diseases.

[503] 631.544.3 : 631.588.1
Brown, C.A.C.; Golding, E. W. **Electrical pre-warming of tomato house soil.** *Brit. Elect. Allied Indust. Tech. Rept.* W/T15, 1948, pp. 26. Hort. Abs. 18 (195).

By means of electricity soil can be warmed sufficiently for optimum planting conditions to be reached in 24 hours. Details of design are discussed. The system recommended involves the use of grids of bare galvanized iron wire buried 12-15 inches in the soil and fed from transformers at 30 volts. A specific loading of 5 watts/sq. foot was most suitable. *Agriculture* 55, 1948 (447-450) contains a shorter description of the method.

[504] 631.547.2 : 539.16
Jornlin, F. M. **The atomic bomb's effects on plants and soils.** *Fert. Rev.* 23, No. 4 (7-11, 14); No. 5, 1948 (7-9, 11-13). C.A. 42 (8607).

From the U.S. Strategic Bombing Surv. Rept. "The effects of atomic bombs on Hiroshima and Nagasaki" June 30, 1946.

Ten plot experiments with different vegetable and cereal crops showed no beneficial effect of radioactivity. One year later, practically no radioactivity was present in the soil at any point. Improved yields attributed by Furuno to the effects of the bomb may have been largely due to the killing of insects, partial sterilization of the soil, ash from burned buildings and increased sunlight owing to removal of buildings and trees.

[505] 631.58 : 631.312.5 : 631.581
Powell, E. C. **Stubble mulch or bare fallow for wheat production.** *Agric. Gaz. N.S.W.* 59, 1948 (505-509).

Stubble-mulch farming is still almost a theory in Australia, but bare fallowing is proven practice. Stubble mulching might provide the benefits of bare fallowing and eliminate its faults and might have a considerable effect on fertility retention and erosion control and also, with an accompanying increase in pastures on wheat farms, might be economically favourable, and in any case deserves a trial.

[506] 631.584 : 631.445.7
Conforti, E. La consociazione delle piante coltivate nei paesi tropicali. **[Mixed cropping in tropical countries.]** *Riv. Agric. Subtrop.* 42, 1948 (218-229). [I.e.]

A distinction is made between "indispensable" and "dispensable" crops. In the former the association is permanent or for some reason is necessary. These associations include windbreaks and shade-trees. In such associations both members, or only one, may be crop plants, and if both are crops one may be secondary to the other. Cultural features such as spacing may be modified from the practice adopted when either crop is grown alone. In "dispensable"

mixed cropping one crop (which may be annual or woody) is planted to fill space usefully for a few years until the other attains an economic age.

631.61 LAND RECLAMATION

(*See also* Abs. No. 768)

[507] 631.612
DENUYL, D. **Reforestation of spoil banks.** Abs. in *Proc. Indiana Acad. Sci. 1946*, 56, 1947 (173). For. Abs. 10 (192).

In 20 years 12,000 acres of spoil bank in stripped coal lands of Indiana have been planted with 30 species of forest trees.

[508] 631.612
SMITH, O. W.; JACQUOT, H. D.; BROWN, R. L. **Stabilization of inland sand dunes in the Pacific Northwest.** *Wash. Agric. Expt. Sta. Bull.* 492, 1947, pp.16. For. Abs. 10 (19).

Vegetative control measures were studied on a fine yellow sand of lacustrine origin, of low fertility and liable to movement even with light breezes. Annual rainfall averaged 9 inches. Out of 43 grasses, 18 survived the test period and 9 produced coarse vegetative growth that persisted above the accumulating sand. *Ammophila arenaria* and a strain of *Elymus giganteus* were the best sand-stilling grasses tested; the latter, because of its aggressiveness, longevity and low palatability, may persist from the initial stage and give effective permanent erosion control on inland dunes. Woody species proving of value for permanent stabilization of inland sand dunes were *Cytisus scoparius*, *Elaeagnus argentea* and *Purshia tridentata*.

[509] 631.612
CENTRAL STATES FOREST EXPERIMENT STATION. **Spoil banks reclamation.** *Cent. St. For. Expt. Sta. Rept. 1947*, 1948 (3-5). For. Abs. 10 (192).

Tests of the effects of levelling spoil banks on tree growth indicate slower growth on levelled than on unlevelled banks composed chiefly of clay, whereas in lighter-textured soils survival and growth seem to be as good on one as on the other. Tests of direct sowing on spoil banks show some promise of success for heavy-seeded species such as oaks and walnuts: sowings of conifer seeds were largely destroyed by erosion. A site classification has been prepared, based on acidity, texture and proportion of soil in the spoils material, together with topography and stability of the banks, character and density of existing vegetation and character of the material forming the overburden.

[510] 631.612
FOREST LEAVES. **Revegetation of spoil piles from bituminous coal strip mining.** *For. Leaves* 38, No. 2, 1948 (12-14). For. Abs. 10 (192).

[511] 631.612 : 633.288
WEBB, K. B. **Weeping lovegrass stills Vermont's sandblows.** *Better Crops* 32, 1948 (11-13, 41-42). [Univ. Vt., Burlington]

Weeping lovegrass (*Eragrostis*) has an unusually extensive root system which helps to hold sand in place. The deep roots can obtain sufficient moisture from the sand to support a luxuriant growth, but they must have minerals, particularly N. that are lacking on sandy soils. The seed is broadcast at the rate of 3 lb./acre and the lime, fertilizer and seed are raked into the surface in one operation. The grass must be seeded early before the surface of the sandblow dries out. Black locust trees are planted in two staggered rows in the grass strips and red pine is planted between the grass-locust strips. A handful of 0-20-20 fertilizer should be put in the bottom of each hole when planting the black locust trees. Fertilizer should not be used with the pine.

[512] 631.612 : 634.957
GOOR, A. Y. **Sand dune fixation in Palestine.** *Palestine Dept. For. Rept.* 1947, App. I, pp. 8. For. Abs. 10 (53).

The progress made in dune fixation in Palestine during the past 30 years is recorded. When planting *Acacia cyanophylla* directly in bare sand, plants 80-120 cm. high are planted to a depth of 40-60 cm. with a shallow depression round the plant. Large cuttings of *Tamarix articulata* and *T. pseudo-pallasi* were set deeply in the sand and proved to be very resistant to burying or exposure by moving sand. The use of *Eucalyptus camaldulensis*, *Pinus pinea*, *Dalbergia sissoo* and *Populus* spp. in dune reclamation is described.

[513] 631.613
RANGHEL GALINDO, A. El sistema de los bancales. **[Contour-bench terraces.]** *Agric. Trop. Bogotá* 4, No. 7, 1948 (31-34). [Sp.]

An outline description of function, dimensions, suitable sites and constructions.

[514] 631.613
RANGHEL GALINDO, A. Acequias de ladera. **[Hillside ditches.]** *Agric. Trop. Bogotá* 4, No. 8, 1948 (49-56). [Sp.]

The functions, siting, dimensions, constructions and vegetative lining of narrow-ridge terraces or "hillside ditches" are described in some detail and working tables are included.

[515] 631.613
RANGHEL GALINDO, A. Las terrazas y su utilizacion en Colombia. **[Terraces and their use in Colombia.]** *Agric. Trop.* 4, No. 11, 1948 (37-40). [Sp.]

Four types of terrace are distinguished and the construction, use and method of calculation for a drainage terrace are discussed.

[516] 631.613
RANGHEL GALINDO, A. Las terrazas y su utilizacion in Colombia. Terrazas de desagüe. **[Terraces and their use in Colombia. Drainage terraces.]** *Agric. Trop. Bogotá* 4, No. 12, 1948 (36-41). [Sp.]

The construction of the common Nichols terrace is discussed, and tables relating discharge to terrace dimensions are included.

[517] 631.613 : 631.67
HALL, F. A. **Large area pastures under irrigation by the contour system.** *Agric. Gaz. N.S.W.* 59, 1948 (563-568).

The advantage of the contour, also called the contour-terrace, system, as compared with the more usual check-bank or border system where the banks run up and down the slope is that it is more economical to maintain as it needs one man for 500-700 acres during watering as against one man for 50-60 acres. It is also easier to cultivate and harvest contoured land. On very light sandy soils very careful watering is necessary in order to avoid the danger of seepage and the resultant salt conditions of the land.

[518] 631.613 : 633.2.03
SMITH, L. W. **Contour furrowing in the Riverina.** *J. Soil Conserv. Serv. N.S.W.* 4, 1948 (101-108).

Under rainfall of less than 25 inches pasture furrows are a valuable and easily applied method of reducing run-off and controlling erosion. Where rainfall exceeds 25 inches/annum pasture improvement including top-dressing with super. is the best method of control, although contour furrows may be of considerable use in reclaiming badly eroded areas. The design, layout and the machinery used in constructing contour furrows are detailed.

[519] 631.616
BAEYENS, J. Studies op de in 1944 overstroomde poldergronden in België, 1^{e} mededeeling : kalk-, bewerkings- en bemestingsproefvelden in 1945. **[Studies on the 1944 flooded polder soils in Belgium. Part I. Liming, cultivation and manuring experimental fields in 1945.]** *Agricultura* 45, 1947 (1-69). [Du.f.e.]

Quicklime, gypsum and $CaCl_2$ improved the soil structure but quicklime was too alkaline and $CaCl_2$ increased the Cl content. Deep ploughing was injurious, but superficial harrowing was beneficial. The river polders of east Flanders and the Scheldt basin improved considerably by the end of 1945, but the structure of the sea polders of west Flanders was still poor. A heavy dressing of complete fertilizer gave good results on the flooded soils and a good crop was obtained in the first year. N and P are particularly necessary, but lack of K is not serious.

[520] 631.616
VERHOEVEN, B.; BERG, C. VAN DER **[Structure of soil inundated with salt water: use of gypsum.]** *Maandbl. Landb-VoorlD.* 4, 1947 (429-435). B.A. BIII, 1948 (311). [Du.]

Flooding with salt water increases the Mg, K and Na contents of soil at the expense of Ca and causes disintegration of the aggregates into sand, clay and humus. Natural recovery can be quickened by the use of $CaSO_4$ which should be applied, if possible, before the complete deterioration of the soil structure, preferably in spring or winter but after the ground has been worked. The upper 6-8 cm. become normal in one

season and afterwards the hard lower layers slowly improve. Yields of grain and straw were increased by 13.5-15.0% by the application of 12 tons/ha. of $CaSO_4.2HO_2$.

631.67 IRRIGATION

(*See also* Abs. Nos. 370, 500, 649 697)

[521] 631.67 : 631.347.24
PEIKERT, F. W. **Irrigation with sprinklers and portable pipe.** *Agric. Engng.* 29, 1948 (541, 544).

Portable-pipe sprinkler irrigation is gaining acceptance from coast to coast, even on comparatively level lands, and has been found profitable even in regions of high annual rainfall. Other uses which have been suggested or put into practice for the equipment include: applying commercial fertilizer, especially N, during the growing season—a very satisfactory practice; protection against frost by operating the system when the air temperature is below freezing point; drainage of places without a gravity outlet; farmstead fire protection; applying insecticides and herbicides—a use which cannot as yet be made. Factors discussed that will affect the future expansion of irrigation include: knowledge of available-water resources; standardization of equipment and practice—in part by regions, depending on the number of applications per season, etc.; the need for a wide research programme and for educational activities.

[522] 631.671
WILCOX, L. V. **The quality of water for irrigation use.** *U.S.D.A. Tech. Bull.* 962, 1948, pp. 40.

Methods of analysis, their accuracy and the significance of the several constituents in respect to the soil and to plants are discussed. Analyses of typical surface and ground waters, and the variation in composition with rate of flow are given in tables. The interpretation of an analysis is considered and a procedure outlined.

631.8 FERTILIZERS

(*See also* Abs. No. 469)

[523] 631.81
BEAR, F. E. **Fertilizers.** *Agric. Chem.* 4, No. 1, 1949 (39-41, 77, 79, 81). [Rutgers Univ., New Brunswick, N.J.]

The organic-inorganic question is discussed. There is no evidence that fertilizers, when rightly used, damage the soil or plants or earthworms or cause deterioration in the food values of plant products. They are as effective as manure when they supply equivalent amounts of N, P and K. Fertilizers, however, are being substituted for good farm management over vast areas of the U.S., where on many farms too large a percentage of the land is devoted to cultivated crops. "It is high time that the fertilizer industry began to think seriously about the means by which land can be kept productive without the use of fertilizer. It would be well advised to conduct an educational campaign and finance research projects on the value of sod crops, the possibilities in the growing of legumes, the practices by which soil erosion can be brought under control, and the means by which badly eroded land can be restored to usefulness."

[524] 631.81 : 631.557
TERMAN, G. L.; FREEMAN, J. F. **Interpretation of yield data from a long-time soil fertility experiment.** *J. Amer. Soc. Agron.* 40, 1948 (874-884). [Ky. Agric. Expt. Sta.]

In an experiment lasting from 1914 to 1944, manure was applied to loam together with super., rock phosphate, ground limestone and muriate of potash. Crops grown were a 4-year rotation of maize, soybean, wheat and mixed hay for the first half of the period followed by 4-year rotations of maize and wheat and 2 years of mixed legume-and-grass hay during the second half of the period. Plots receiving no treatment showed a downward trend in maize yields. P fertilizer was not an important factor affecting yield trends. By means of an analysis of variance, yield variation and differences were broken down into their component parts and a very significant difference was found between treatments, between years and for the reduction in variance due to the trends in yields. Variability of yield data for different years was evaluated by calculating coefficients of variability for the various treatments. Low-yielding treatments were considerably more variable than high-yielding ones. Significant correlations were found between maize yields and weather data for critical periods.

631.811 PLANT NUTRITION

(*See also* Abs. Nos. 385, 577, 717, 721)

[525] 631.811

RATNER, E. I. **[The distribution of water and minerals in plants and the absorbing activity of roots.]** *Pochvovedenie* 1948 (622-629). [Timiriazev Acad., Moscow]

Barley was grown in sand cultures at high, medium and low levels of mineral nutrition, and the uptake of minerals by the roots, and sub-aerial organs was determined after 26 days' growth. In both parts the uptake of minerals increased with the level of nutrition, but relatively much more in the case of roots than of the sub-aerial parts, i.e., at low levels of nutrition the roots starved, and at high levels they absorbed excessive amounts of minerals. A similar relationship was observed with water; in presence of a deficiency the water content of roots fell more rapidly than that of the sub-aerial organs.

It is suggested that these relationships reflect the adaptation of the organism to the nutrient environment. The impoverishment of the roots in cations in a soil deficient in nutrients stimulates the activity of the roots competing with the soil colloids for nutrients. The impoverishment of the roots in water when the water supply is restricted, results in a change in the colloidal properties of their tissues that inhibits the excessive absorption of minerals.

[526] 631.811 : 539.16

JANSSON, S. L. Isotopmetodiken som hjälpmedel inom växtfysiologien, markläran och gödselläran. **[Use of isotopic tracers in plant physiology, soil science and fertilizing practice. A literature review.]** *Kgl. LantbrAkad. Tidskr.* 87, 1948 (370-392). [Sw.e.]

The theoretical and fundamental principles underlying the use of rare stable isotopes and radioactive isotopes as chemical and biological tracers are reviewed. The bibliography includes literature published up to and including 1948 on the following subjects: chemical and microbiological processes in the soil; the uptake of nutrients by the plant and the availability of plant nutrients in the soil; translocation and assimilation studies in the plant.

[527] 631.811 : 539.16

STOUT, P. R.; OVERSTREET, R.; JACOBSON, L. ET AL. **The use of radioactive tracers in plant nutrition studies.** *Proc. Soil Sci. Soc. Amer. 1947,* 12, 1948 (91-97). Univ. Calif.]

The applications of radioactive isotopes to studies in soils and plant nutrition are reviewed. These include experimental work on the direct tracing of gross transport of salts in living systems; micronutrient-element studies with radioisotopes of high specific activity, with special reference to Zn; fertilizer studies such as the mineral nutrition of grape vines; exchange reactions; the special role of C and N in plant nutrition; and studies with fission products.

[528] 631.811.1 : 631.416.1

PRITCHETT, W. L.; BLACK, C. A.; NELSON, L. B. **Mineralizable nitrogen in soils in relation to the response of oats to nitrogen fertilization.** *Proc. Soil Sci. Soc. Amer. 1947,* 12, 1948 (327-331). [Iowa Agric. Expt. Sta., Ames]

The results over 4 years of 58 field experiments in Iowa indicate that the increase in yield of oats due to N fertilizing was inversely related to the mineralizable-N content of the soil, which was obtained by determining the increase in NH_4-, NO_2- and NO_3-N in the soils after incubation for 3 weeks at 30°C. It is concluded that a regression equation relating mineralizable soil N with oat response to N fertilizing can be used as a means of prediction, provided the equation represents the average of several years' data.

[529] 631.811.2 : 539.16

DEAN, L. A.; NELSON, W. L.; MACKENZIE, A. J. ET AL. **Application of radioactive tracer technique to studies of phosphatic fertilizer utilization by crops: I. Greenhouse experiments.** *Proc. Soil Sci. Soc. Amer. 1947,* 12, 1948 (107-112). [N.C. Agric. Expt. Sta. and U.S.D.A. Beltsville]

Greenhouse experiments are described and discussed (see *Soils and Fert.* 12 [104]). These included the study of a soil degraded by intensive farming under irrigation without P fertilizers and of an adjacent soil under crested wheat grass without irrigation. P_2O_5 was applied at 50 and 150 lb./acre one inch below and to the side of ryegrass seed,

by mixing with the top third of the soil and by mixing with all the soil. The percentage of P in the crop derived from the fertilizer was greater on the irrigated than on the dry-land soil, at the higher rate of application and when the fertilizer was mixed with the top third of the soil. In another experiment the effects of crop species, placement and rates were studied on four soils with lettuce and Sudan grass. Results agreed with those of the previous experiment. Band placement gave important increases in the growth of lettuce with two of the soils, but only slight increases in the growth of Sudan grass.

[530] 631.811.2 : 539.16
NELSON, W. L.; KRANTZ, B. A.; COLWELL, W. E. ET AL. **Application of radioactive tracer technique to studies of phosphatic fertilizer utilization by crops : II. Field experiments.** *Proc. Soil Sci. Soc. Amer. 1947*, 12, 1948 (113-118). [N.C. Agric. Expt. Sta. and Me. Agric. Expt. Sta.]

The experiments referred to in *Soils and Ferts.* 12 [104] are reported in detail.

[531] 631.811.9
ØDELIEN, M. Mikroelementenes betydning for planteproduksjonen og husdyrbruket i Norge. **[The significance of micro-elements for plant and livestock production in Norway.]** *Nord. JordbrForsk.* 4-6, 1948 (711-721). [N.]

Soils deficient in Fe and micro-elements, particularly B and Cu, are common in the coastal districts of Norway where soils and natural vegetation resemble the Cu-deficient areas of Denmark, Holland and Germany. Studies of the micro-element problem are concerned with methods for estimation of availability by laboratory methods and the recognition of deficiency symptoms of various crops in the field and the effect of application of micro-elements to soils. The interaction between Cu and Mn or Fe has presented a problem of practical significance. The application of $CuSO_4$ to limes but still acid peats which are Cu deficient and in addition are deficient in Mn or Fe results in marked increases in the deficiency symptoms of Mn or Fe. In some cases such an application may produce severe Fe chlorosis where control plots without Cu show no chlorosis. The Cu problem is regarded as one of cultivation rather than of fertilizing. Successful progress has been made in the incorporation of B with various fertilizers.

Co deficiency of hay causing "pining" in cattle is known on sandy or peaty soils where the total Co content of hay is below .001 p.p.m. in dry matter, whereas animals healthy where the vegetation contains 0.075-0.25 p.p.m.—S.G.H.

[532] 631.811.9
STEENBJERG, F. Mikronæringsstofferne og Jordbruget. Resultater af nyere Undersøgelser og Forsøg i Danmark. **[Micronutrients and agriculture. Results of new investigations or experiments in Denmark.]** *Nord. JordbrForsk.* 4-6, 1948 (722-733). [Da.]

Unlike Sweden and Norway where only comparatively few field trials test the effect of micro-elements on soils deficient in such elements, Denmark has numerous field trials extending over a number of years testing the application of Mn and Cu. During the years 1923-1945 the results of 475 trials with $MnSO_4$ and 720 trials with $CuSO_4$ gave valuable results for advisory work and for the study of the balance of micro-elements in a variety of soils. Increases in yields on obviously deficient soils have been considerable. Average increase in grain of cereals from 359 trials for an application of 50 lb. of $MnSO_4$/acre was 289 lb./acre, and 383 lb./acre was obtained for 50 lb. of $CuSO_4$ in 332 trials. Cu has a longer-lasting and greater residual effect than Mn. Empirical methods worked out for estimating availability of Mn and Cu have proved satisfactory under Danish conditions. —S.G.H.

[533] 631.811.9 : 546.27
PHILIPSON, T. Svenska studier över mikroelement. Borstudier. **[Swedish studies on micro-elements. Boron.]** *Nord. JordbrForsk.* 4-6, 1948 (704-708 710-711). [Sw.e.]

The availability of B in soils has been estimated with sufficient reliability by acid extraction (pH about 2.0) of soils. The average acid-extractable B content of a large number of Swedish soils lies between 0.4 and 6 p.p.m. No limits of this B fraction have been found to denote acute deficiency, but field trials show that an application of 20 lb. of borax per acre can be regarded as sufficient for crops known to possess a high B requirement. The recovery of applied B is small—about 10%.—S.G.H.

[534] 631.811.9 : 546.56
STENBERG, M.; EKMAN, P.; LUNDBLAD, K. ET AL. Svenska studier över mikroelement. Kopparstudier. **[Swedish studies on micro-elements. Copper.]** *Nord. Jordbr-Forsk.* 4-6, 1948 (689-700, 709). [Sw.e.]

The average Cu content of hay from soils deficient in Cu was 6-7 p.p.m. of Cu in dry matter with an average of 5.8-6.0 p.p.m. in grasses and 8.7-9.8 p.p.m. in leguminous plants. Analyses of plants from control plots in field trials on Cu-deficient soils show considerable variations in Cu content from year to year as well as from one part of a uniform field to another. It is therefore regarded as unreliable to use conclusions based on plant analyses to estimate the Cu status of a soil. Determination of total Cu content of soils and of corresponding plants, mostly grasses, showed that 20-25 p.p.m. of Cu in organic soils sufficed to produce grass crops with normal Cu content; corresponding values for mineral soils were 8-10 p.p.m. of Cu. These values would correspond to 16 lb. and 20 lb. of Cu per acre for a peat and a mineral soil, respectively. In field trials on an acutely Cu-deficient peat with hay as crop, application of 25 lb. of $CuSO_4$ was sufficient to improve the Cu status of the soil and crop.—S.G.H.

[535] 631.811.9 : 546.711
EKMAN, P. Svenska studier över mikroelement. Manganstudier. **[Swedish studies on micro-elements. Manganese.]** *Nord. JordbrForsk.* 4-6, 1948 (700-704, 709-710). [Sw.e.]

Determinations of total Mn in a large number of hay samples representing a wide range of soils showed that 75% of the samples had a Mn content of 20-100 p.p.m. Increasing available Mn of soils has been studied either by application of less soluble Mn salts incorporated in super. or by using Mn in a complex form or by acidification.
—S.G.H.

631.812 STORAGE OF FERTILIZERS

[536] 631.812
CHEMISTRY AND INDUSTRY. **The caking of fertilizers.** *Chem. Indust.*, Jan. 29, 1949 (71).

Serious caking of compound fertilizers can be prevented by the addition of 3% of sawdust or peat during mixing. Caking is considerably less under dry than under damp conditions.

631.816 APPLICATION OF FERTILIZERS

(*See also* Abs. Nos. 547, 606, 615, 683)

[537] 631.816.3
RICH, A. E.; ODLAND, T. E. **Fertilizer placement for silage corn.** *Proc. Soil Sci. Soc. Amer. 1947*, 12, 1948 (253-254). [R.I. Agric. Expt. Sta.]

In a three-year experiment with silage maize on fertile, very fine sandy loam 1,000 lb. of 4-12-8 fertilizer per acre was applied in spring: just before planting; by broadcasting and ploughing under; in the bottom of each furrow following the plough; in two bands at two inches from the seed and at the same depth, and by broadcasting followed by harrowing-in with a disc harrow. Combinations of these methods were also used. Variations in yields were small and insignificant, but more rapid early growth of the crop was produced by band than by deep placement, and this lessened weed competition.

[538] 631.816.32
CALDWELL, A. C. **Effect of deep placement of large amounts of fertilizer on crop yields.** *Hormel Inst. Univ. Minn. Rept.* 1946-1947, (7-9). B.A. BIII, 1948 (353).

Deep placements of large amounts of fertilizer caused large increases in the yield of maize, but these were usually not profitable; the increased yield was profitable when 200 lb. of 8 : 16 : 12 per acre was applied in the hill at planting time. Fertilizer treatment gave only minor increases in the yield of flax. Profitable increase in the yield of soybeans was obtained when fertilizers containing K were ploughed deeply into the soil.

[539] 631.816.32
MACAULAY INSTITUTE. **Fertilizer placement.** *Macaulay Inst. Rept. 1947-48*, 1948 (23-24).

Combine drilling of $(NH_4)_2SO_4$ to cereals does not affect the response to combine-drill applications of super. With K there has been

little difference between combine-drilling and broadcasting; muriate of potash can be combine-drilled with oat seed at rates up to 1 cwt./acre without injurious effects. Higher yields are obtained from combine-drilling of NP and NPK mixtures than from similar dressings broadcast. With turnips and swedes, placement of super. in bands near to, but not in contact with, the seed is superior to broadcasting.

[540] 631.816.34

FRITZSCHE, R. Die Düngung der Obstbäume. **[The manuring of fruit trees.]** *Schweiz. Ztschr. Obst- u. Weinb.* 57, 1948 (56-59). Hort. Abs. 18 (171). [G.]

A plea is made for the use of the fertilizer lance for fruit trees in sod. The soil area under the spread of the branches should be determined and 1 l./sq.m. of 10% solution should be applied, or the circumference of the trunk at breast height should be measured and 1 l. of 10% solution should be applied for each cm. of semi-circumference. For moderately vigorous trees a 10% solution should be made up of 2 parts of super., 4 parts of $(NH_4)NO_3$ or 3 parts of $(NH_4)_2SO_4$ and 3 parts of a K salt.

[541] 631.816.34 : 634

SIMON, G. La fertilisation des arbres fruitiers au pal injecteur. **[Manuring fruit trees by soil injection.]** *Fruit Belge* 16, 1948 (89-91). Hort. Abs. 18 (171).

An account is given of soil injection with fertilizer, the injecting lances being operated from a truck. The technique of injection and the quantities of fertilizers used are described.

631.82 MINERAL AMENDMENTS. LIME. MAGNESIUM

(*See also* Abs. No. 520)

[542] 631.821 : 669.16

PEROTTI, R. Fertilizzazione biochimica del suolo con scorie di alti forni e sgrigliature di gassogeni a lignite. **[Biochemical manuring with blast-furnace slag and residues from gasification of lignite.]** *Ann. Fac. Agrar. Univ. Pisa* 8, 1947 (130-155). [I.]

The material alleged to be blast-furnace slag contained 75% of matter insoluble in HCl under conditions not stated, 10% of Fe_2O_3 and 5.5% of CaO+MgO; the lignite residue was similar but rather poorer in useful bases. Laboratory, pot and field experiments showed little difference in behaviour between the two materials; the lignite product appeared to increase the water-holding capacity of soil, but no appreciable increase in bacterial numbers, nitrification, N-fixing powers, germination of seed or yield of wheat, maize or potatoes was affected by either material.—R.N.

[543] 631.821 : 669.16

MACINTIRE, W. H.; WINTERBERG, S. H.; HARDIN, L. J. ET AL. **The comparative effectiveness of blast-furnace and electric furnace slags in greenhouse experiments.** *Proc. Soil Sci. Soc. Amer. 1947*, 12, 1948 (145-152). [Univ. Tenn. Agric. Expt. Sta.]

Crop response, P_2O_5 content and uptake and induced soil-pH changes were used in pot studies to compare blast-furnace slags that had been (a) air-cooled (dense crystalline) and (b) water-quenched (granular glassy) with quenched electric-furnace slags, (c) from the Tennessee Valley Authority rock-phosphate reduction furnaces and (d) from a concern using rock phosphate less concentrated by washing and therefore containing more clay. The P_2O_5 content of (a) and (b) were brought up to that of (c) and (d) by adding super. Basic slag was not tested. Crop response to (a) and (b) equalled that to (c) and was considerably greater than that to (d). P_2O_5 uptake was always greatest from (c). The glassy slags (b) were more effective than the air-cooled (a). The occurrence of Al_2O_3 in (c) and (d) reflects the occurrence of clay in the starting ore and governs the percentage of gehlenite, an increase in which lowers the availability of the contained Ca and P. Infusion of Al_2O_3 into (c) caused a drop in crop response, P_2O_5 uptake and pH rise, while (d) was made increasingly effective by infusions of limestone and quartz and of dolomite. (c) induced pH values of about 2.3 in soil of pH 5.1, (d) and (b) induced values of 6.2-6.8 and (a) of 5.8-6.2.

[544] 631.821 : 669.16 : 631.415.1

TOMULA, E. S.; PUROKOSKI, P. **[The use of synthetic calcium metasilicates for the improvement of acid soils.]** *Suomen Kemistilehti* 21B, 1948 (35-42). C.A. 42 (8389). [G.] [Univ. Helsinki]

The Ca metasilicate contained: SiO_2 50.71%, Al_2O_3 1.76%, Fe_2O_3 0.72%, CaO 43.47%, MgO 0.10% and Cl 2.41%. The Cl content was high owing to the omission of the usual Mn catalyst to avoid undesirable effects in the vegetation studies. The average pH of soils varying from 3.52 to 5.78 was raised from 4.39 to 6.56 by the use of Ca metasilicate, and vegetation studies showed it to be highly beneficial for acid soils.

[545] 631.821.1 : 631.815
KORABLEVA, L. I. **[The influence of the continuing action of lime on the acidity of podzolized soils.]** *Pochvovedenie* 1948 (569-575). [R.]

The effects of 4.5, 9, 18 and 22.5 tons/ha. of $CaCO_3$, applied in one dose, on pH, exchange and hydrolytic acidity were studied at various periods up to 25 years from the date of application. 25 years after the largest dose had been given the pH was 7.3 (compared with 5.6 in the control), exchange acidity was absent and the hydrolytic acidity was one third that of the control. The effect of the smaller doses (4.5 and 9 tons) on pH disappeared after about 20 years, but their effect on exchange and hydrolytic acidity was still considerable. The effects were apparent even at 50 cm. depth, where the content of exchangeable Ca was appreciably higher in the limed than in the unlimed soil.

[546] 631.824
MAZAEVA, M. M. **[Soil conditions influencing the effectiveness of magnesium fertilizers.]** *Pochvovedenie* 1948 (630-635). [R.]

In pot experiments with NPK and Mg fertilizers (quantities not given) using a variety of crops, very large responses to Mg were obtained on a podzolized soil, and no response was obtained from a chernozem. The effect seemed to be associated with an increased absorption of Mg by the plants and not to any indirect influence on the Ca/Mg ratio or on P availability. Soils containing Na, even though rich in Mg, responded to Mg fertilizers—an expression of antagonism between Mg and Na. Continued use of physiologically acid N fertilizers increased the response to Mg, as also did NK fertilizers.

631.84 NITROGEN FERTILIZERS

(*See also* Abs. No. 676)

[547] 631.84 : 631.816.3
BOYNTON, D. **Recent developments in nitrogen fertilizers and ways of applying them to orchards.** *Proc. N.Y. St. Hort. Soc. 93rd Ann. Meet.* 1948 (110-113). Hort. Abs. 18 (171).

Three developments are mentioned: the use of (1) ammonia gas from cylinders, injected into irrigation water or into soil; (2) nitrogen solutions (ammonia liquor, ammonium-nitrate solution, ammonium-nitrate solution saturated or supersaturated with ammonia); and (3) urea sprays. (1) would probably be useful only in peach and cherry orchards or vineyards under clean cultivation, (2) will probably not be used extensively unless there is a price advantage or a shortage of granular material, (3) may help to solve certain problems connected with biennial bearing, fruit colour and quality.

[548] 631.841 : 631.842
SALOMON, M.; SMITH, J. B. **The effect on soil of long-continued use of nitrate of soda and sulphate of ammonia as single nitrogen sources.** *Proc. Soil Sci. Soc. Amer. 1947*, 12, 1948 (296-299). [R.I. Agric. Expt. Sta., Kingston]

The effect of 53 years of fertilizing at an average rate of about 0.5 ton/acre/year of a 5-11-11 fertilizer was studied on a very fine sandy loam. Acre applications totalling 8.6 tons of $NaNO_3$ with 0.0 and 5.68 tons of CaO equivalent (pH levels 5.3 and 6.1) were compared, as a single source of N, with 6.5 tons of $(NH_4)_2SO_4$ with 3.75 and 9.43 tons of CaO equivalent (pH levels 5.1 and 5.9). The differential liming maintained approximately equivalent degrees of acidity.

The major soil differences noted were the increases in exchangeable Ca and Mg and decreases in exchangeable H caused by liming. The extra lime applied to overcome the acidity caused by $(NH_4)_2SO_4$ had little effect on the exchangeable Ca in the topsoil as compared with the $NaNO_3$ plots at similar pH levels. The increase in exchangeable Na in the $NaNO_3$ plots was too small to affect crop growth or soil structure. Only minor differences were found for exchangeable K, Mn and NH_4. Accumulations of organic

matter were a little greater in the more acid of the topsoils, but the differences were too small to affect measurements of exchange capacity. The subsoil layers (7-14 inches) under the $(NH_4)_2SO_4$ treatments had slightly more organic matter with wider C/N ratios and higher exchange capacities than in the $NaNO_3$ plots.

[549] 631.841.8 : 631.842.4
HAMMONS, J. G. **The efficiency of anhydrous ammonia as a source of nitrogen on fall-planted oats for forage and grain production.** *Proc. Soil Sci. Soc. Amer. 1947*, 12, 1948 (266-269). [Miss. Agric. Expt. Sta.]

Anhydrous NH_3 was applied the day before planting forage oats to 3 types of fine sandy loam supplied with P and K. NH_4NO_3 was applied to a second series of plots two weeks after planting; both sources supplied 32 and 64 lb. of N per acre. Similar amounts of N from both sources were applied to half the plots of each series the following spring for grain production. Both sources were equally effective for forage production on Ora and Prentiss soils. On Savannah soil highest yields were obtained on the NH_3 plots which were not attacked by aphids as were the control and NH_4NO_3 plots. In all cases the production of forage was twice as much with 64 lb. as with 32 lb. of N. Uptake of N was proportional to the forage produced and the amount of N applied. NH_4NO_3 produced 5 bushels more oats per acre than did anhydrous NH_3 where 32 lb. of N were applied in the spring; this was probably due to loss of NH_3 as the openings made by the applicators in the wet soil tended to stand open. Where the oats were clipped, yields were unaffected by the rate or source of autumn-applied N.

[550] 631.842 : 545
LEITHE, W. **Oxidimetric nitrate analysis of fertilizers and other commercial products.** *Anal. Chem.* 20, 1948 (1082-1084). [Oesterreich. Stickstoffw. AG, Linz]

The oxidimetric method for determining nitrate in water or soil extracts was adapted for the routine analysis of products such as fertilizers. Any carbonates present in the sample were decomposed by HCl, and insoluble constituents such as clays, which interfere catalytically with nitrate decomposition, filtered off before adding the $FeSO_4$. After acidification to give a 6-8 M solution of H_2SO_4 and heating for 4 minutes the solution was titrated with standard $KMnO_4$. $K^{\cdot}$, $Na^{\cdot}$, $NH_4^{\cdot}$, $Ca^{\cdot\cdot}$, $Fe^{\cdot\cdot\cdot}$, $Mn^{\cdot\cdot}$, $Cu^{\cdot\cdot}$, $Zn^{\cdot\cdot}$, Cl', SO_4'' and PO_4''' did not interfere. A procedure using 0.1 n. $K_2Cr_2O_7$ was less susceptible than the $KMnO_4$ method to impurities such as clay. Any nitrite present was decomposed by urea. An accuracy of 0.3% was obtained.

631.85 PHOSPHORUS FERTILIZERS

[551] 631.85
GERICKE, S. **[The study of phosphates. IV.]** *Angew. Chem.* 60A, 1948 (98-99). C.A. 42 (8391). [G.]

On the basis of experimental data for oats grown in neutral sandy soil and of findings reported previously, the relative availability of P_2O_5, SiO_2 and CaO in the basic P fertilizers is shown to be a function of hydroxyapatite formation.

[552] 631.85 : 631.416.2
ASKINASI, D. L. **[The mobility of the P_2O_5 of calcium diphosphate when introduced into carbonate or saline soils, according to the data of alkaline extracts.]** *Pochvovedenie* 1948 (641-649). [R.]

Calcareous and saline soils were mixed with $CaHPO_4$ and $CaCO_3$, $CaSO_4$ or $MgSO_4$ and extracted with 1% K_2CO_3 or 1% NaOH, and P determined in the extract. K_2CO_3 extracted much more P than NaOH, the extract including, apparently, phosphates of Al and Fe, organic P and $CaHPO_4$. $CaCO_3$ increased the P dissolved by the K_2CO_3 but not by the NaOH extract. Small quantities of $CaSO_4$ increased, and large quantities decreased, P extraction by K_2CO_3. $MgSO_4$ had a greater effect than $CaSO_4$ in reducing the extraction of P. Comparatively little P was extracted from $CaHSO_4$ in saline soils by K_2CO_3, presumably because of the presence in them of Ca and Mg salts.

[553] 631.85 : 631.815
RICH, C. I.; OBENSHAIN, S. S.; MCVICKAR, M. H. **The relation of certain soil phosphorus factors in Dunmore silt loam to fertilizer treatment and crop yields.** *Proc. Soil Sci. Soc. Amer. 1947*, 12, 1948 (270-274). [Va. Polytech. Inst., Blacksburg]

After yearly applications of P for 28 years to limed soil of pH 6-6.5 under a rotation of maize, wheat, clover hay and clover + timothy hay, no fall in yield due to lack of P occurred during 5 years when P was not applied. P applied to a soil low in readily soluble P appeared to affect yields as much as the same quantities applied where residual readily-soluble P was high, but this might not hold at higher general-fertility levels. 54-69% of the P from super., rock phosphate and manure remained in the top 6 inches after 33 years of application. Of the residual P from super., 23% remained dilute-acid-soluble and 53% exchangeable, the corresponding figures being 36% and 0.0% for rock phosphate which also caused no direct increase in exchangeable P. Although the anion-exchange complex is less than 14% saturated after 33 years in which over 15,000 lb./acre of 16% super. have been added, the effectiveness of super. in increasing dilute-acid-soluble P in the soil appears to be greater.

[554] 631.85 : 633.61
AIRAN, J. W. **Phosphate from bagasse ash.** *Curr. Sci.* 17, 1948 (262). [Rajaram Coll., Kolhapur]

Bagasse ash contains P in an unavailable form, Ca, Mg, K, Al and Fe. It is suggested that bagasse should be used with firewood rich in K as a mixed fuel in furnaces so that the ash may contain soluble P and serve as a valuable fertilizer.

[555] 631.851 : 545
BARTON, C. J. **Photometric analysis of phosphate rock.** *Anal. Chem.* 20, 1948 (1068-1073). [Inter. Minerals Chem. Corp. Mulberry, Fla.]

The main constituents of phosphate rock were determined in a single sample. Acid-insoluble matter was obtained by boiling with one-to-one HCl and estimating the precipitate gravimetrically. Phosphate, Fe and Al were determined colorimetrically in the diluted filtrate using the phosphovanadomolybdate, 1,10-phenanthroline and alizarin methods respectively. In order to reduce the Fe completely it was necessary always to use a fresh solution of hydroxylamine hydrochloride, while interference by F and Fe in the determination of Al was prevented by evaporation with H_2SO_4 and making measurements at 370 mμ respectively. The accuracy obtained compared favourably with that of the commonly used gravimetric and volumetric methods.

[556] 631.851 : 545
KASSNER, J. L.; CRAMMER, H. P.; OZIER, M. A. **Determination of phosphorus pentoxide in phosphate rock.** *Anal. Chem.* 20, 1948 (1052-1055). [Univ. Ala.]

A procedure was developed to eliminate the empirical nature of the alkalimetric method of determining P_2O_5 in phosphate rock. Silica was removed by heating with $HClO_4$ and HNO_3. Water was added, the mixture filtered and citromolybdate added to the filtrate and boiled. A precipitate of uniform composition was formed. After boiling and filtering, the precipitate was washed with neutral KNO_3 or cold water and dissolved in excess 0.3 n. NaOH solution. The excess NaOH was titrated with 0.1 n. HNO_3 using a mixed indicator of bromothymol blue and phenol red that gives a sharp colour change at the stoichiometric endpoint. The pH at which the purple colour could be seen varied with light conditions, but an illuminator fitted with a fluorescent daylight lamp or direct sunlight gave good results. Precision and accuracy of the procedure were good; the maximum deviation in 30 consecutive samples was 0.1 mg., and the average deviation 0.05 mg. of P_2O_5.

[557] 631.853 : 539.215
BARBIER, G.; TROCME, S. Vitesse de décomposition des scories dans le sol selon leur finesse de mouture. **[Rate of decomposition in soil of basic slags in relation to fineness of grinding.]** *C.R. Acad. Agric.* 34, 1948 (799-803). [F.]

The water solubility of 3 slags at about neutral pH varied largely according to their origin, although their citrate solubilities were similar. It was necessary to grind the 3 slags to pass a 150 sieve in order to obtain 40% decomposition (as determined by non-recovery with bromoform) in 3 months in a moist soil of pH 8. With grinding to pass an 80-90 sieve, at least 70% remained undecomposed after 3 months.

[558] 631.858 : 631.812
LEMAIRE, E. **Manufacture of an assimilable phosphate without the use of sulphuric acid.** *Génie Civil* 124, 1947 (195-197). C.A. 42 (9031).

The process of treating apatite with SiO_2 at 1400-1500°C. in the presence of steam to obtain $Ca_3(PO_4)_2$

631.86/7 ORGANIC MANURES

(*See also* Abs. Nos. 523, 643)

[559] 631.86/7
CROWTHER, E. M. **The study of soil organic matter and organic manures by means of field experiments.** *C.R. Conf. Pédol. Méditerr. 1947,* 1948 (123-139). [E.] [Rothamsted]

An account of experiments carried out at Rothamsted and Woburn, England, and at Lyngby, Denmark, to determine the immediate and residual effects of organic compared with inorganic manures. The N content of the organically manured plot on Broadbalk field, Rothamsted, increased, at first rapidly and then slowly, for the first 70 years, then declined slightly, probably as a result of the introduction of a fallow every fifth year. The N content of inorganically manured plots has remained constant at a low level. In long-term rotation experiments at Lyngby farmyard manure gave half the increases in yield obtained by equivalent NPK, but was rather more effective in the second than in the first 12 years. In rotation experiments at Rothamsted on residual values, the effects of manure, straw and super. fell off rapidly in the year after application and then quite slowly. In experiments with potatoes the value of farmyard manure was shown to be due largely to its K content. In general, responses to N are as great on crops receiving farmyard manure as on those without it; the effect of the manure is to make the land capable of responding to larger amounts of all the plant foods. The balance of N, P and K should be different on dunged and undunged land. Preliminary results of ley experiments at Woburn have shown that land without dung after a 3-year ley gave about the same yield (of potatoes) as land with dung after cultivated crops, and that the effects of dung were least after a 3-year grazed ley.

Comment is made on the unavoidable complexity of field experiments designed to measure the effects of organic-matter additions to the soil.

[560] 631.862 : 631.812
VÁRALLYAY, G.; KAPP, O. **[Experiments on the preservation of urine.]** *Agrártudományi Szemle* 2, 1948 (109-114). C.A. 42 (9036).

Laboratory experiments showed that airtight containers gave best results either with liquid urine or with urine absorbed by straw or peat. If urine were covered by a layer of used lubricating oil, 96% of the original N content could be preserved during storage for 5 months. A simple concrete container when closed tightly or covered by an oil layer was effective for 3-4 months. Fully humified peat was less suitable as an absorbent for urine than imperfectly humified peat or straw. The saltpetre method of urine treatment caused significant N losses. When 2.5 l. of urine was absorbed by 1 kg. of soil, the loss of N amounted to 78% as against 25% when 0.5 l. of urine was used for 1 kg. of soil.

[561] 631.87 : 632.556.7
KARIM, A. **Microbiological decomposition of water hyacinth.** *Soil Sci.* 66, 1948 (401-416). [Dacca Univ.]

The suitability of water hyacinth as a source of manure was investigated. Oven-dried material containing 1.7% of N, 1.9% of fats and waxes, 7.7% of furfural, 40.0% of cellulose, 16.0% of lignin, 10.7% of protein and 43.2% of C and with a C/N ratio of 25.26, was treated in 10-g. batches with 0.05 g. of N as $(NH_4)_2SO_4$, NH_4NO_3 or $NaNO_3$ in solution. Each flask was inoculated with 1 ml. of a suspension of well rotted manure and the material of two series allowed to decompose aerobically and anaerobically respectively, for 90 days. Loss of dry matter was greater under aerobic than anaerobic conditions, probably owing to the inability of fungi to grow anaerobically. Maximum decomposition occurred with $NaNO_3$, when 63% of dry matter was lost compared with 52% without N. Of the individual constituents cellulose decomposed most, especially during the first 15 days. Lignin was most resistant and there was a progressive increase in the percentage of N during aerobic, but not anaerobic, decomposition.

Two soils of differing pH were treated in 700-g. amounts with 7 g. of stem powder of 3.5 g. of leaf powder and the mixture maintained at a moisture content of 15%. Tota

N contents remained constant for the 60 days of the experiment while NH_4 increased until the 45th day; less NH_4 accumulated in the alkaline than in the acid soil. Nitrification, however, did not take place until after 45 days. Bacteria and fungi multiplied rapidly, especially in the treated soils, the acid soil giving higher fungal counts than the alkaline, while the reverse held for bacteria. Azotobacter was less abundant in the treated soil and water hyacinth did not appear to be a satisfactory source of energy for N-fixing bacteria.

It is concluded that the weed offers definite promise as a N-carrying manure; this conclusion is supported by comparison of the composition of the decomposed material with that of horse manure.

[562] 631.871 : 636.086.25
WILLARD, C. J. **Combined straw injurious to clover seedlings.** *Paper Trade J.* 126, 1948 *TAPPI Sect.* (221-223). B.A. BIII, 1948 (355-356).

It has been shown that when combined straw is left during the winter on new seedlings of clover and lucerne these crops are damaged and the yield of hay in the following year is reduced. Any appreciable accumulation of organic matter on top of a new clover stand appears to damage growth by an amount approximately proportional to the amount of organic matter greater than 1 ton per acre. Clover is affected more than lucerne. It is recommended that the stubble and straw should be removed immediately after combining.

[563] 631.874
O'GRADY, L. J. **The effect of alfalfa and sugar beet residues on following crops.** *Contr. Inst. d'Oka* 5, 1949, pp. 79. [E.]

In a comparison of the effect of lucerne at different stages of maturity on the following sugar-beet crop, the highest yields were obtained for sugar beet following the incorporation of one-year-old fertilized lucerne. Fertilized lucerne nitrified usually more rapidly than unfertilized lucerne. Sugar-beet tops had a beneficial effect on following crops when incorporated with soil at seeding time, but gave better results after 3 months' decomposition. Beet roots had a depressive effect even when mixed with tops.

[564] 631.874 : 633.376 : 636.086.25
GROH. **[Decomposing straw with green manure.]** *Deut Landw.* 2, 1948 (1-2). B.A. BIII, 1948 (311). [G.]

When rotting straw was applied to fully grown serradella in the field and the mixture ploughed under after the autumn rains but before winter set in, the yield of potatoes the following season was greater than with serradella alone.

[565] 631.875 : 631.417.2
SHRIKHANDE, J. G. **The biological decomposition of green manures. III. The chemical character of humus in compost heaps.** *Indian J. Agric. Sci.* 17, 1947 (25-31). [Tea Res. Inst. Ceylon, Talawakelle]

The organic matter of composts from tea estates was separated into fractions by treatment with H_2O_2. A quantitative relationship was established between lignin and N. The lignin:N ratio of the humic fraction was more or less constant and approximated to 12 : 1, whereas in the non-humic fraction the ratio was of the order 20 : 1. The high lignin content of the non-humic fraction may cause it to resist nitrification in the soil.

[566] 631.875 : 631.461.74
WEBLEY, D. M. **The microbiology of composting. The behaviour of the aerobic mesophilic bacterial flora of composts and its relation to other changes taking place during composting.** *Proc. Soc. Appl. Bact.* 1947 (83-89). [Macaulay Inst.]

Chopped barley straw which had been moistened and sprayed with ammonium nitrate solution, and grass cuttings were composted in concrete containers. Little change in moisture content occurred during composting. The grass reached its maximum temperature of 65°C. in two days while the temperature of the straw rose to a maximum of 62°C. in 8-9 days. The number of organisms present in the original grass was reduced to 3.7×10^6 at the maximum temperature and rose to $11{,}537 \times 10^6$ when the temperature fell to 26.5°C. During the high-temperature phase the number of thermophilic flora was at its highest.

[567] 631.875 : 631.812
TIMSON, S. D. **The making of compost.** *Rhod. Agric. J.* 45, 1948 (225-229).

A method is described for growing bulky crops which are cut and spread with sawdust in cattle pens for bedding. Wood ash or

agricultural lime is added from time to time. When this is removed it is stacked in heaps which should be turned 3 times before use.

[568] 631.875 : 634.989.84
REINMUTH, E. **[Decomposition of various leaves in composts.]** *Forsch. u. Fortschr.* 21/23, 1948 (279-281). B.A. BIII, 1948 (312). [G.]

Composts made from various tree leaves and needles were examined for general condition and surface colonization; pH values of the composts and corresponding ground water were recorded.

[569] 631.876.9 : 633.71
MAHANT, S. D.; PANDIT, P.N. **By-products of tobacco industry. I. Tobacco seed and its utilization.** *J. Sci. Indust. Res. (India)* 7A, 1948 (229-230). B.A. BII, 1948 (548).

Tobacco-seed cake has potential uses as a fertilizer.

[570] 631.876.9 : 634.8
JACOB, H. E. **Fertilizer value of pomace.** *Comm. Fert.* 77, No. 2 (46); *Wines and Vines* 29, 1948 (24). C A. 42 (9035). [Univ. Calif.]

Pomace from grapes is stated to have about the same value as ordinary corral manure but has a more lasting effect. The N content ranges from 0.6% to 1.3% and averages about 0.9%; the K_2O content varies from 0.5-1.5%, averaging somewhat less than 1% and the P_2O_5 content averages about 0.25%.

[571] 631.876.9 : 637.1
IVERSON, V. E.; JOHNSON, L. H. **Effects of milk by-products on vegetable yields.** *Food Packer* 29, No. 7, 1948 (64, 66-67). C.A. 42 (9032). [Montana Agric. Expt. Sta.]

Applications of either skim milk or buttermilk when compared with no treatment resulted in highly significant increases of yields of tomatoes, and applications of skim milk, buttermilk and commercial fertilizers when compared with no treatment resulted in highly significant increases in total yields of sweet Spanish onions.

[572] 631.876.9 : 664.15
REICH, G. T. **Molasses.** *Mem. Asoc. Téc. Azucar Cuba* 21, 1947 (327-346). C.A. 42 (9070).

The stillage is concentrated in a multiple effect for use as a fertilizer or is carbonized at 1500-1600°F. to produce decolourizing carbon and K_2CO_3.

[573] 631.879.2
MINISTRY OF AGRICULTURE. **The agricultural use of sewage sludge and sludge composts.** *Min. Agric. Tech. Commun.* 7, 1948, pp.18.

A comparison of the effects of farmyard manure and sewage sludge showed that sewage sludge should be regarded essentially as a N manure lacking the other valuable properties of farmyard manure. Sewage sludge is therefore to be considered as having a moderate manurial value as a source of slowly available N and P but providing very little K. Composts of sludge and straw are better than sewage sludge alone as they supply some K and have better physical effects on the soil. Wet sewage sludge should never be used for salad and other crops eaten raw, and sewage sludges from drying beds should be used only when they can be applied some months before these crops are sown.

[574] 631.879.2 : 631.812
HOWARD, A. **Activated and digested sewage sludge in agriculture and horticulture.** *J. Inst. Sewage Purif.* 1946, Pt. 2 (37-57).

When crude sewage has been acted on by bacteria to produce sludge, the combined N, P and K in the effluent should be recovered by the growth of water plants such as water hyacinth which are then composted. The Indore process of composting garden and farm-waste materials is described.

[575] 631.879.3 : 576.809.7
JACOBS, S. E.; MARSDEN, A. W. **The role of antibiotics in the decomposition of sawdust. II. The inhibition of the growth of cellulose-decomposing fungi.** *Ann. Appl. Biol.* 35, 1948 (18-24).

Cold-water extracts of deal sawdust contained substances which strongly inhibited the growth of *Stachybotrys atra* and *Chaetomium indicum.* The extracts also contained material which stimulated the growth of *C. globosum* but not that of the other two fungi. There was no marked inhibition or stimulation of the growth of 2 species of *Aspergillus* or 3 species of *Penicillium* by the extracts.

632 PLANT DISEASES AND PROTECTION

(*See also* Abs. Nos. 605, 607, 611, 616, 645, 661, 662, 677, 684, 693, 699, 718, 722, 728)

[576] 632 : 576.809.7
GROSSBARD, E. **The control of plant diseases by microbial antagonism.** *Cheshunt Expt. Res. Sta. Rept. 1947*, 1948 (29-39).

Penicillium patulum produced an antibiotic substance when cultured on sterilized soil to which either straw or glucose or sugar-beet pulp was added This substance inhibited the growth of some *Bacillus* and *Phytophthora* spp. An experiment is described on the introduction of *P. patulum* into sterilized soil and its possible influence on the damping-off of tomato seedlings caused by *Phytophthora parasitica*. The rate of emergence of seedlings was greater when *P. patulum* was present and the incidence of the disease was slightly reduced.

[577] 632.191 : 546.72
HEWITT, E. J. **Relation of manganese and some other metals to the iron status of plants.** *Nature* 161, 1948 (489-490). [Long Ashton]

From a review of the results of experiments with sugar beet it is concluded that Mn is not unique in its ability to induce Fe-deficiency symptoms and that other metals such as Cu, Zn, Cr, Ni and Co may act in this respect.

[578] 632.191 : 546.77
WILSON, R. D.; WARING, E. J. **Some observations and experiments concerning the role of molybdenum in the nutrition of the flowering plant.** *J. Aust. Inst. Agric. Sci.* 14, 1948 (141-145). [Dept. Agric. and Hawkesbury Agric. Coll., Richmond, N.S.W.]

An intervenal chlorosis of cauliflower leaves, believed to be an early stage of whiptail disease, was treated with 0.025-2 g. of sodium molybdate or ammonium molybdate per plant. Oxidizing materials in the intervenal areas, determined by tests with diphenylamine-sulphuric acid, disappeared in younger chlorotic leaves in 2½-5 days after treatment, and in 5-7 days the leaves became healthy dark green. It seems that Mo acts as a catalyst in the reduction processes of the cauliflower plant, probably in the reduction of nitrates.

[579] 632.2 : 632.953
NEWHALL, A. G.; LEAR, B. **Field trials in New York with ethylene dibromide and DD mixture against the root-knot nematode.** Abs. in *Phytopath.* 38, 1948 (19-20).

200 and 300 lb./acre of DD mixture and 10% ethylene-dibromide mixture were applied in rows 10 and 12 inches apart on muck and upland soils. Weeds were not controlled to any extent by any treatment. Carrots grown subsequently showed an increase in yield of 50.9% above the control after DD and 49.4% after ethylene dibromide on the muck soil. On two upland soils increases in yield were 155% and 122.8% respectively. The 300-lb. application and the narrower row-spacing were the more effective, but the doses were near the limit for spring treatments because of possible injury to seedlings and flavouring of the carrots.

[580] 632.4 : 631.582
STREETS, R. B. **Profitable use of root-rot-infested irrigated land.** Abs. in *Phytopath.* 38. 1948 (918-919).

Cost analyses were made on seven rotations with cotton or flax as the principal cash crop in comparison with continuous cotton on root-rot-infested, irrigated land for the years 1944-47. Root rot, caused by *Phymatotrichum omnivorum*, was reduced in varying amounts, but not eliminated from the plots; the net returns per acre were increased. The rotations in order of profit were:—barley, guar for seed, S and N, cotton, cotton; winter legume for green manure, cotton; manure in furrows under cotton rows; early guar for seed, flax; guar for green manure, flax; manure in furrows plus S and N, sesbania for green manure, flax; continuous cotton.

632.5 WEEDS

(*See also* Abs. No. 711)

[581] 632.554.21 : 632.954
WOLF, D. E.; ENGLE, R. E.; AHLGREN, G. H. **Chemical crabgrass control.** *Agric. Chem.* 3, No. 11, 1948 (25-27, 73). [N.J. Agric. Expt. Sta., Brunswick]

Crabgrass (*Digitaria* sp.) is a serious pest in maize, potatoes and turf. The present rather unsatisfactory methods of control are discussed. The use of arsenicals on turf

is limited by their toxicity and burning effect; of $NaClO_3$ by its discolouring effect and the fire hazard, while phenyl mercuries, the most effective, are too costly for use on large areas. The use of oil formulations and of K cyanate as selective crabgrass killers is foreshadowed. In field crops, cultivation gives early-season control, but pre-emergence control by 2,4-D (1-1.5 lb. of acid equivalent) or granular calcium cyanamide (300 lb./acre applied immediately after the planting of maize) is being used in a limited way and shows promise of further development.

[582] 632.557.1
MOORE, H. I.; BURR, S. **The control of rushes on newly reseeded land in Yorkshire.** *J. Brit. Grassland Soc.* 3, 1948 (283-290).

To prevent rushes becoming established on newly reseeded land, the drainage, level of fertility, choice of seeds mixture and management of the sward are important. Established rushes can be eliminated in time by repeated cutting followed by appropriate fertilizer treatment. Experiments showed that rush seedlings will develop into strong healthy plants if the atmosphere is around 70-85% saturated and drying-out in the early stages of growth is prevented. The young rush seedling is also unable to withstand the least mechanical injury or disturbance or the intense competition of a thick stand of grasses and clovers. When reseeding, an adequate supply of lime and NPK is essential. With sodium chlorate at the rate of 2 cwt. applied in October a 90% kill was obtained. Methoxone applied as a spray on established plants at a rate of 9096 cc. in 100 gallons of water killed 85-90% of the rushes but also severely checked such clover as was present.

[583] 632.573.6 : 632.954 : 577.17
BROWN, J. F. **Control of blackberry and gorse with hormone sprays.** *N.Z. J. Agric.* 77, 1948 (503-504).

Details of preliminary trials in Canterbury. Though good results have been obtained in Canterbury by using the oil-based hormone weedkiller and kerosene mixture, experimental work will have to continue for a year or two before a final pronouncement can be made. In other districts trials have not always been as successful as those in Canterbury, but in many cases the mixture has been quite effective. Until conclusive results have been obtained it is not considered advisable to treat any but small patches of blackberry or gorse about the farm. It is important to spray blackberry and gorse only when they are growing strongly. As more spray will be absorbed when the plant is carrying the maximum foliage, the best time to spray is from mid-November to the end of January.

632.7 INSECT PESTS

[584] 632.7
JOHANSSON, E. Något om jordflylarver och deras bekämpning. **[Cutworms and their control.]** *Växtskyddnotiser* 1947, No. 5, (78-80). Hort. Abs. 18 (204).

Control was ineffective with DDT. 10-15 kg./ha. of 666 gave better results, but the unpleasant smell and taste resulting from this treatment made the tubers unfit for food. Soil treatment after the lifting of the crop might kill the pest.

[585] 632.7 : 546.23
SKINNER, H. T. **Selenium and the insect pests of boxwood.** *Morris Arboretum Bull.* 4, 1948 (73-79).

Injury to boxwood by insect pests is probably increased as a result of serious weakening of the plant by nematodes. When the soil was watered with readily water-soluble sodium selenate at the rate of 1 g. of Se per square foot of root area, leaf miner, mite and psylla were controlled fairly effectively provided the Se was applied in spring just before growth began. Insects were partly controlled with ½ gm./square foot, but with 2 g. roots were injured. Applications of 1 g./square foot reduced root nematode populations on most varieties of boxwood except English box, *Buxus Sempervirens suffruticosa*, and trees were restored within a year.

[586] 632.765 : 633.1
BROADBENT, L. **Note on the effect of wireworms of the genera *Agriotes* and *Corymbites* on crop yields.** *Ann. Appl. Biol.* 33, 1946 (166-169).

Experiments showed a regular falling off of yield of crops due to increasing wireworm populations under controlled conditions. *Corymbites* caused as much damage as did *Agriotes*; *Anthous* was less harmful. Spring

oats and spring wheat are liable to greater damage by *Agriotes* larvae than are winter oats and winter wheat. Rye is also liable to severe damage, but spring barley can tolerate fairly high populations.

[587] 632.765 : 633.61
McDougall, W. A. **Investigations on the control of wireworms (*Lacon variabilis* Cand.) in canefields with "Gammexane".** *Queensland J. Agric. Sci.* 4, 1947 (140-150).

Applications of 12½-400 lb./acre of 10% Gammexane dust containing 1.3% gamma isomer of benzene hexachloride, made directly to cane setts, gave complete or almost complete control of wireworms, but the rooting of setts was much reduced. Indirect application after a soil cover of ½ inch had been applied gave a substantial degree of control for all amounts of Gammexane, but with dosages higher than 50 lb./acre there was a toxic effect on rooting. Applications of 25 lb./acre gave a high degree of control of wireworms without excessive damage to rooting. The persistence of Gammexane in the soil for more than 8 months is an advantage, as cane eyes vulnerable to wireworms sometimes remain dormant for months.

632.8 VIRUS DISEASES

[588] 632.8 : 631.432.2
Howles, R. **The relation between susceptibility to virus infection and amount of water added to soil.** *Cheshunt Expt. Res. Sta. Rept. 1947*, 1948 (24-26).

In an experiment with tomato plants on the relationship between the degree of infection with potato virus *x* and the degree of turgidity at inoculation, the wilted leaf absorbed more virus than the turgid leaf. In an experiment in which soil in plant pots was watered with (a) 100 c.c. of water per day and (b) 100 c.c. of water after inoculation, the more turgid plants, receiving (a), were more susceptible to the virus.

632.95 INSECTICIDES FUNGICIDES HERBICIDES

(*See also* Abs. Nos. 583, 626, 645, 646, 650, 665, 693, 705, 722, 788)

[589] 632.951
Smith, M. S. **Persistence of D.D.T. and benzene hexachloride in soils.** *Ann. Appl. Biol.* 35, 1948 (494-505). [Wye Coll., Univ. London]

Acid and alkaline soils, both alone and mixed with 2% of DDT or 2% of benzene hexachloride were exposed out of doors or subjected to controlled leaching in the laboratory. Residual insecticide was estimated by a method involving dehydrohalogenation and determinations were made of chloride content of soil, chloride leached and pH. Both DDT and benzene hexachloride were very stable in the soils, 95% of the former and 80% of the latter being recoverable after 18 months. Very little chloride was leached during this period. 18 months after treatment the benzene-hexachloride soils prevented root growth of germinating seeds, but germination and early growth were normal in the DDT soils. This harmful effect of the residual benzene hexachloride was still apparent when 1 part of the treated soil was mixed with 99 parts of the control soil; this represents a concentration of less than 0.002% of the γ-isomer.

[590] 632.951
Agricultural Chemicals. **New pesticide chemicals.** *Agric. Chem.* 4, No. 1, 1949 (21-25, 81).

Summaries of papers given at the 1948 meeting of the American Association of Economic Entomologists. Toxicity to plants, livestock, birds and fish and in human food are treated at some length. All the insecticides tested at Beltsville accumulated in the soil to some extent, but their toxicity varied with the soil type and with plant varieties of the same species.

[591] 632.953
Thorne, G. **Fumigation for soil-inhabiting pests.** *Canner*, 106, No. 14, 1948 (12-13). Biol. Abs. 22 (2256). [Bur. Pl. Indust., U.S.D.A., Salt Lake City]

Fumigants should be applied when soil moisture is comparable to that of a good seed bed. Dry, loose soil allows the gas to escape and excessive moisture prevents the proper diffusion of the gas. Soil temperature should be 40-85°F. at a depth of 6 inches. Land should be ploughed to the usual depth and the soil should be in good planting condition without clods, straw, roots or coarse manure which will form holes allowing the fumigant to escape. The fumigant should be placed 6-8 inches deep and the surface

should be worked down firmly after application. Planting should be delayed 7-10 days after application to prevent injury to young seedlings.

[592] 632.953
SCHMITT, C. G. **Comparison of volatile soil fungicides.** Abs. in *Phytopath.* 39, 1949 (21).

Of over 600 soil fungicides tested in pots at 80°F., 12 of the more effective volatile fumigants were compared to determine approximate minimum lethal dosages (m.l.d.) in soil for the vegetative mycelia of several phytopathogenic fungi. Chloropicrin was most effective and killed all the test fungi at 7.6 gall./acre when sealed in and at 42.6 gall./acre under a water seal. Other m.l.d. were 61 gall, for allyl bromide, 76 gall. for allyl and ethyl isothiocyanate, 380 gall. for formalin, Iscobrome (15% methyl bromide in xylene) and D-D, and 456 gall. for allyl chloride and methyl bromoacetate.

[593] 632.953 : 631.461.52
KERNKAMP, M. F. **Chemical treatment of soybean seed in relation to nodulation by nodule bacteria.** *Phytopath.* 38, 1948 (955-959).

Soybean seeds were treated with Spergon (tetrachloro-p-benzoquinone) at a rate of 2 oz./bushel and inoculated with Nitragin. In non-autoclaved soil, nodules developed equally well on inoculated and uninoculated seedlings, regardless of the time of inoculation with respect to the time of treatment with Spergon. When partially sterilized soil was used there were no significant differences in nodulation when treatment with Spergon without inoculum was compared with inoculation (a) two days before, (b) two days after, and (c) at the same time as treatment with Spergon. Nodulation was reduced in completely untreated seeds.

[594] 632.953 : 631.811.1
PALMITER, D. H. **The effects of Fermate on the yield of McIntosh apples.** Abs. in *Phytopath.* 39, 1949 (18).

The continuous use of Fermate (ferric dimethyldithiocarbamate) on McIntosh apple trees which had received no N fertilizer for 6 years increased the yield of fruit by 57% over that of corresponding trees sprayed with wettable S. Annual soil applications of 2 or more lb. of N per tree increased the yield of S-sprayed trees over that of the unfertilized Fermate plots during the first 2 years of the test, but not in the last 3 years. Among the factors responsible for the increased yield with Fermate is the N content of the fungicide ; a tree may receive as much as $\frac{1}{4}$ lb. of N in a spray season.

[595] 632.953 : 632.4
ZENTMYER, G. A.; KLOTZ, L. J. **Soil fumigants for control of *Phytophthora* root rots.** Abs. in *Phytopath.* 39, 1949 (26-27).

Phytophthora cinnamomi and *P. citrophthora* in soil were killed by injections of D-D at 50 gall./acre foot, but the normal soil microflora was not affected at dosages lethal to the pathogens. In extensive field trials, injection of infested soil with D-D at 60 gall./acre gave good control of avocado root rot. In greenhouse tests chloropicrin, methyl bromide and Dithane (di-Na ethylene bisdithiocarbamate) also killed the two fungi, although Dithane did not penetrate the soil adequately. Ethylene dibromide was fungicidal only at dosages of 100 gall./acre foot.

[596] 632.954
HILDEBRAND, E. M. **Chemical control of weeds.** *Proc. Amer. Soc. Hort. Sci.* 50, 1947 (383-391). [Texas A. & M. Coll., College Sta.]

Review of recent work on 2,4-D, Sinox, oils and Benodor.

[597] 632.954
LYNCH, P. B. **Chemical methods of weed control.** *N.Z. J. Agric.* 77, 1948 (437-444).

In a compilation of reports from members of the Chemical Weed Control Sub-committee, the reaction of a number of crop and pasture plants and weeds to weed-killers of the hormone type, D.N.O.C. materials, sodium chlorate and power kerosene, are described. Recommendations for the treatment of these crops are given.

[598] 632.954
OSWALD, H.; ÅBERG, E. Kampen mot ogräset. **[Weed control.]** *Växtodling* 3, 1948 (74-92). [Sw.e.]

A general review of the use of sodium chlorate, cyanamide (nitrolim), sulphuric acid, copper salts, dinitro-orthocresol, dinitrobutylphenol, hormone derivatives, and

mineral-oil derivatives. A long table is included giving the Swedish and Latin names of common weeds and their sensitivity or resistance to the different weedkillers.

[599] 632.954
AGRICULTURAL CHEMICALS. **New chemicals introduced as weed killers at North Central conference.** *Agric. Chem.* 4, No. 1, 1949 (32-34, 69, 71, 73).

The conference policy committee's report is summarized:—Perennial weeds need several 2,4-D applications, generally near the bud stage. Annual weeds are more susceptible in early stages, during periods of rapid growth. 2,4-D may be used where legumes are undersown in cereals only where some reduction in legume stand can be tolerated. Flax should be sprayed early, as soon as enough weeds are present to make it practical, and winter cereals in spring, before the boot stage. Pre-emergence use of 2,4-D for maize is an adjunct to cultivation and not a substitute on all soil types. Chemical weed control in horticultural crops is also an aid to, rather than a substitute for, cultivation and, except for carrots, much more research is needed. Due to lack of knowledge, 2,4-D, oils, PCP (pentachlorophenol), dinitros and TCA cannot be recommended for potatoes, sugar beet or legumes. Woody plants sensitive to 2,4-D foliage sprays can be killed by 2% ester applied during active growth. TCA at 80-100 lb./acre is promising for control of some perennial grasses, including quackgrass, and IPC at 3-5 lb./acre for certain annual grasses. PCP shows promise for pre-emergence use with large-seeded and vegetatively-propagated crops. 2,4,5-T is effective on some woody plants not affected by 2,4-D. Its best use is in combination with 2,4-D.

[600] 632.954 : 577.17
WARREN, G. F.; BUCHHOLTZ, K. P.; HERNANDEZ, T. P. **Preliminary studies on the effects of soil applications of 2,4-D on crop and weed growth.** *Proc. Amer. Soc. Hort. Sci.* 50, 1947 (373-382). [Univ. Wisconsin, Madison]

To be effective, 2,4-D must be present in toxic concentrations at the time weed seeds are germinating. The length of the period of toxicity depended on the rate of application and on soil moisture. Germination of crop plants was reduced and maturity was delayed by 2,4-D treatments.

[601] 632.954 : 577.17
ÅBERG, E.; HAGSAND, E.; VÄÄRTNÖU, H. Hormonderivat i kampen med ogräs. V. Fältförsök 1946-1947. **[Hormone derivatives against weeds. V. Field experiments in 1946-1947.]** *Växtodling* 3, 1948 (8-64). [Sw.e.]

Various proprietary weedkillers of the methoxone and 2,4-D types were tested. The two types showed certain differences in effect, but were equally good on cereals and grasses for seed production. The methoxone group was better for flax, and the 2,4-D group for grassland. Early spraying on the growing crop is recommended. When applied with fertilizers to the soil larger quantities of the preparations are required, and even then are less effective than spraying.

[602] 632.954 : 577.17
CAPINPIN, R. I.; OCFERRIA, G. O. **A study of weed eradication with 2,4-D in lawns, vacant lots, and pastures.** *Philipp. Agricst.* 31, 1948 (239-255).

Lists are given of non-graminaceous species of weeds (1) that are tolerant to 2,4-D and (2) that can be effectively controlled with a single application of 1000 p.p.m. of 2,4-D.

[603] 632.954 : 577.17 : 631.453
WEAVER, R. J. **Some uses of activated carbon in contratoxification of plant growth-regulators.** *Bot. Gaz.* 110, 1948 (300-312). [Univ. of Calif., Davis]

100-500 lb./acre of Norit A was required for complete contratoxification of NH_4(2,4-D) previously applied to a field soil at the rate of 10 lb./acre. A mixture of Norit A and soil covering a row of seeds protected the germinating plants from broadcast applications of plant-growth regulators, and weed control was effective. A cone of contratoxificant $\frac{1}{2}$ inch in diameter at the soil surface above a seed protected the germinating seed against a plant-growth regulator later applied at the surface. A concentration of 1000 p.p.m. of Norit A in soil was sufficient. Norit A mixed with field soil retained its absorptive capacity for NH_4(2,4-D) for at least 12 days. Coating bean seeds with Norit A before planting in soil previously treated with NH_4(2,4-D) gave partial protection to germinating seeds. (See *Soils and Fertilizers* 11 [261]).

[604] 632.954 : 577.17 : 631.547.1
MARTH, P. C.; TOOLE, E. H. ;TOOLE, V. K. **Effect of 2,4-dichlorophenoxy-acetic acid on seed development and germination in certain cereal and grass crops.** *J. Amer. Soc. Agron.* 40, 1948 (916-918). [Bur. Pl. Indust., U.S.D.A., Beltsville, Md.]

Wheat and rye grain from plots to which the acid form of 2,4-D had been applied before seeding were shrivelled and poorly developed, but germinated satisfactorily. The average germination of the wheat was 84% and of the rye 88%.

633.1 CEREALS

(*See also* Abs. Nos. 435, 537, 549, 586, 786)

[605] 633.1-2.19-1.811
HEDLUND, T. Om stråsädens näringsupptagande med särskild hänsyn till gråfläcksjukans orsak. **[The nutrient uptake of straw crops with special reference to the cause of greyspeck disease.]** *Uppsala* 1948, pp. 91. [Sw.]

These investigations of the physiological disorder producing greyspeck in oats were carried out between 1904 and 1927, thus covering a period in which Mn deficiency as the primary if not the sole cause of the necrosis had not generally been accepted. The interest is centred round the processes governing nutrient—particularly N and K—uptake and the accumulation and transportation of bicarbonates and sugars within the plant. Analyses of plant constituents showed that low potash content of the ash was often associated with necrotic leaf conditions. The similarity between greyspeck in oats and symptoms produced when oats grew in media with ferric phosphate as the source of iron and with high bicarbonate concentrations led to the view that greyspeck should not be ascribed to Mn deficiency, but should be regarded as a damage caused by too-high bicarbonate concentration in the leaves, resulting in local high alkalinity. According to the author the primary cause is the presence of ferric phosphate in the growing media adversely affecting the sugar transportation to the roots, where due to low sugar content large amounts of bicarbonates can accumulate and be transported to the leaves. Although sufficient experimental evidence is lacking as regards the mechanism of the effect of ferric phosphate on sugar transportation to the roots, the suggested explanation agrees with the author's interpretation of results of water-culture experiments by Sachs in 1860. Mn deficiency proper, affecting a chlorotic condition of the plant, as distinct from necrotic spots developed after formation of chlorophyll as in greyspeck of oats, is regarded by the author as a problem of a different nature. The beneficial effects from application of Mn salts to, or by partial sterilization of, the soil are explained by the resulting decrease in calcium-bicarbonate concentration in the soil.—S.H.

[606] 633.11-1.816
SMITH, F. W. **The effect of time, rate and method of application of fertilizer on the yield and quality of hard red winter wheat.** *Proc. Soil Sci. Soc. Amer. 1947*, 12, 1948 (262-265). [Kansas Agric. Expt. Sta.]

The fertilizers used per acre comprised NH_4NO_3 equivalent to 25, 50 and 100 lb. of N, and 20% super. equivalent to 25 and 50 lb. of P_2O_5, applied singly and in various combinations; placements included application on the ploughsole and with the seed, broadcasting on the stubble and topdressing in spring. A complete fertilizer containing 25 lb. each of N, P_2O_5 and K_2O was also applied. Treatments giving highly significant increases in yield were, in order of decreasing yield, 25 lb. of P_2O_5 at seeding combined with 25 lb. of N as a topdressing, NPK at seeding, 25 lb. each of N and P_2O_5 at seeding, and 50 lb. each of N and P_2O_5 applied on the ploughsole. Significant increases were given by 25 lb. of P_2O_5 at seeding with 50 lb. of N in spring, by a similar application, except that the P_2O_5 was applied on the ploughsole and by 50 lb. each of N and P_2O_5 at seeding. Application of 25 lb. of P_2O_5 on the ploughsole with 25 lb. of N either as a topdressing or on the ploughsole did not increase yields.

Differences in protein content and increases in test weight were not significant for any treatment; the latter was reduced by large applications of N alone.

[607] 633.11-2.4-1.5
GARRETT, S. D.; MANN, H. H. **Soil conditions and the take-all disease of wheat. X. Control of the disease under continuous cultivation of a spring-sown cereal.** *Ann. Appl. Biol.* 35, 1948 (435-442). [Rothamsted]

In a field experiment, winter wheat was followed by 2 consecutive crops of spring-sown barley. Samples of the barley crop were taken for estimation of root-disease rating, and grain yields were recorded. A comparison of 6 autumn treatments of the stubble showed that treatments affecting the available-N content of the soil exercised a predominant effect on the incidence of take-all in the following crop. Effects of N applied in autumn were (1) an immediate one in assisting survival of *Ophiobolus graminis* in infected root and stubble residues and (2) a deferred effect in promoting disease escape of the following crop. Ploughing-in of straw in autumn increased the incidence of take-all, presumably because the adverse deferred effect of decomposing straw in locking up available N and withholding it from the following crop outweighed its beneficial immediate effect in helping to starve out *O. graminis*, by depriving the fungus of N. Autumn growth of under-sown trefoil on the stubble land seemed to be entirely beneficial; active growth of the trefoil appeared to assist in starving out *O. graminis*, and N was released by decomposition of the trefoil in the soil, after spring ploughing, in time to benefit the barley crop immediately following.

[608] 633.13-1.411.4 : 546.56
GAARDER, T.; RØYSET, S. Forsøk med kobber til havre på Vestlandsk myr. [**Experiments with copper on oats on moor soil in western Norway.**] *Bergens Mus. Årbok 1946/47, Naturv. Rekke*, H2, No. 5, 1948, pp. 88. C.A. 42 (8394). [N.e.]

Field experiments with Cu on a previously uncultivated moor were carried out on "Jøtul" oats. The Cu concentrations in grain and straw were strongly influenced by the pH, whether Cu had been added to the soil or not, and seemed to be at a minimum at about pH 5.5 and at a maximum at pH 4.6. The yields of crop and grain increased with increasing Cu concentration in soil of the same pH. Liming to pH 4.5 was advantageous when at the same time about 12 mg. of Cu per litre of soil was added in the uppermost 15 cm., i.e., at the rate of 7 kg. of $CuSO_4.5H_2O$ per 1000 square metres. Since, however, the ripening period of the oats is advanced at pH 6, it is best to lime first to that value, if sufficient Cu and Fe are present in the soil and to lower the pH later to 4.5 at which Cu and Fe mobilize more readily. The addition of Cu to the soil has checked the "yellow-tip" disease, strengthened the straw of the oat plants and considerably reduced the percentage of "white ears."

[609] 633.13-1.584 : 635.656
POHJAKALLIO, O.; SALONEN, A. Über den Einfluss von Erbse auf die Trockensubstanzerzeugung von Hafer in Erbse-Hafer-Mischbestand. [**The effect of peas on the dry-matter production of oats in mixed cropping with peas.**] *Maat. Aikak.* 20, 1948 (143-156). [G.fi.]

In pot experiments there was no apparent effect on oat yields due to the excretion of bacterial N. A decrease of the length of day to 10 hours decreased the yield of both crops, but day length had no influence on the provision by the peas of nutrients to the oats. The superiority of the oat yields in mixed crop to those growing alone was due to the reception by the oats of N mainly from pea seeds which failed to germinate or whose seedlings died young or became independent before exhausting the seed stores.

[610] 633.13-1.81
CALDWELL, A. C. **Effect of fertilizer on yield and quality of oats.** *Hormel Inst. Univ. Minn. Rept.* 1946-1947, (6-7). B.A. BIII, 1948 (355).

At present it is profitable to apply 60 lb. of N, 20 lb. of PO_4 and 20 lb. of K_2O per acre to soils growing oats in Mower County. Adoption of a system of farming for incorporating organic matter in the soil, so that little or no commercial N would be required, should be considered.

[611] 633.13-2.191 : 546.56
HARRIS, H. C. **Copper deficiency in relation to the nutrition of oats.** *Proc. Soil Sci. Soc. Amer. 1947*, 12 1948 (278-281). [Fla. Agric. Expt. Sta.]

In field experiments to determine the cause of abnormality of oats, plots were treated with a basal fertilizer and all possible combinations of Cu, B, Mn, Zn and Mo. In a second experiment seed treatment with New Improved Ceresan and application of 300 lb. of $NaNO_3$ per acre were incorporated into the treatments. Experiments on the residual effects of Cu which had been applied to cotton were also conducted. All plots

treated with Cu were free of abnormality symptoms, which were unaffected by other minor elements. The residual effect was considerable, an application of 2 lb. of $CuCl_2$ being effective after 30 years and one of 30 lb. of Cu sulphate after 5 years. The condition was unaffected by seed treatment and basal fertilizer, but high N accentuated the abnormality and resulted in a decrease in grain yield.

[612] 633.15-1.582-1.81

WEIDEMANN, A. G. **Continuous corn vs. corn in rotation.** *Mich. Agric. Expt. Sta. Quart. Bull.* 30, 1947 (80-85).

In the first year yield from fertilized plots was substantially greater than that from unfertilized plots. Yield from unfertilized continuous-maize plots was greater than that from unfertilized rotation-maize plots in both grain and stover, but yields from continuous-maize plots with fertilizer were greater than from fertilized rotation plots in grain but not in stover. After 7 years the yield of grain from unfertilized continuous maize was almost nil, but plots growing maize in rotation maintained a fairly level state of productivity. A high state of soil fertility can be maintained by not applying fertilizer directly to the maize crop, but to another crop in the rotation. Maize cannot be grown more than twice in succession on the best corn-belt soils and not more than once on lighter soils.

[613] 633.15-1.81

CALDWELL, A. C. **Fertilizer application in relation to growth, yield and quality of maize.** *Hormel Inst. Univ. Minn. Rept.* 1946-1947 (5-6). B.A. BIII, 1948 (355).

The most effective ratios of fertilizer N, P and K for application to maize were 1:1:2, 1:2:2 and 1:4:4. Fields differed appreciably in response to fertilizers, depending on soil type, previous history and management. All fertilizer treatments reduced the moisture content of the maize at harvest.

[614] 633.15-2.4-1.436

HOPPE, P. E. **Differences in Pythium injury to corn seedlings at high and low soil temperatures.** *Phytopath.* 39, 1949 (77-84). [Wis. Agric. Expt. Sta.]

Crown-wounded maize kernels, untreated and dusted with Arasan, were inoculated with a species of *Pythium* and grown either at 11°C. for 14 days and then at 20-24°C. or entirely at 20-24°C. One series was grown in a naturally infested compost soil and the other in a layer of sterile sand over compost soil. At the lower temperature complete pre-emergence killing occurred with non-treated seed in compost soil while Arasan-dusted seeds produced good stands of healthy seedlings. Treated and untreated seeds grown in sterilized sand also produced healthy seedlings. At the higher soil temperature severe stunting of seedlings from untreated kernels occurred in naturally infested soil, but Arasan treatment gave almost perfect control of the disease. Only a few stunted seedlings were observed where the kernels had germinated in the layer of autoclaved sand, thereby demonstrating that the stunting was caused by soil fungi and not by seed-borne parasites.

[615] 633.16-1.84-1.816.2

BERGSTRÖM, C. Kombinerade sort- och kvävegödslingsförsök med korn vid Sveriges Utsädesförening i Svalöf åren 1943-45. **[Combined variety and nitrogen-dressing tests with barley at the Swedish Seed Association at Svalöf in 1943-1945.]** *Sverig. Utsädesfören. Tidskr.* 58, 1948 (288-295). [Sw.e.]

Dressings of easily-soluble N fertilizers applied late at straw shooting or heading increased the crude-protein content of the grain, but there was no profit as the growing crop was damaged during application. A dressing of 400 kg. of saltpetre at time of sowing is the most reliable dressing tested. In farming practice, easily-soluble N fertilizers are usually applied some time after sowing, but not as late as at the time of shooting.

[616] 633.18-2.2

CRALLEY, E. M. **White tip of rice.** Abs. in *Phytopath.* 39, 1949 (5).

White tip of rice has previously been attributed to mineral deficiencies in the soil, but recent investigations indicate that the disease is caused by a nematode. Symptoms are similar to those caused by *Aphelenchoides oryzae* Yokoo, found in Japan. The disease has been successfully controlled in the greenhouse by treating infected seed with hot water.

633.2/3 GRASSES. LEGUMES

(*See also* Abs. Nos. 453, 511, 518, 786)

[617] 633.2/3-1.81 : 581.192

JACKSON, M. L.; EVANS, C. E.; ATTOE, O. J. ET AL. **Soil fertility level in relation to mineral and botanical composition of forage.** *Proc. Soil Sci. Soc. Amer. 1947*, 12, 1948 (282-288). [Wis. Agric. Expt. Sta.]

Various soil-fertility levels were established on poorly drained silt loam of pH 5.0-5.5 by application of various combinations of P, K and dolomitic limestone to the 4-year rotation, maize-grain-hay-hay. Clover was dominant in the first-year hay, especially on the unlimed plots, and increased in the second year on plots receiving P and K only. The percentage of lucerne on the limed, highly fertilized plots increased from 10-20% in the hay in the first year to 20-39% in the second year, but on the unlimed plots dropped from 6% to less than 1%, even at high fertility levels. Plots receiving lime at 4½ and 8 tons/acre provided 60-100% more total legumes than the unlimed.

The K content of lucerne and red clover fell in the second year and from the first cutting to the second cutting. With increasing fertility level the K content rose from 14 to 17 m.e. per 100 g. while Mg and Ca dropped from 87 to 26 m.e. and 47 to 31 m.e. respectively, except in the second cutting of the second year when the Ca was nearly doubled and the K became very low. The total content of Ca, Mg, Na and K varied much less than that of the individual cations, the highest total-cation content occurring when the plants were growing slowly in midseason with a subcritical K content and a Ca:K ratio wider than 4:1. The lowest total-cation concentration occurred in rapidly growing plants with a K content at the critical percentage of 1.25 and a Ca:K ratio of less than 4:1. The percentage of P increased with increasing fertility level and decreased with liming.

[618] 633.2.03-1.445.13

KJAR, N. A. M.; WILSON, R. J. **Pasture establishment on sandy heath soils. Summary of four years trial at "Waterhouse".** *Tasm. J. Agric.* 19, 1948 (176-189).

Sandy heath soils, known also as "humus podzols" and "ground-water podzols" were suitable for the establishment of clover pastures. The essential measures were; a bare fallow for at least twelve months before sowing seed, in well cleared areas, after a good "burn", ploughing 4-4½ inches deep with a heavy disc, leaving in a rough state over the winter with further breaking down the following spring and summer with disc implements preparatory for early-autumn sowing. Super. at the rate of 3 cwt./acre and subsequent top-dressing for some years was considered essential. Liming with ½-1 ton/acre of ground limestone was beneficial on some soils. NK gave negative results, as did trace elements. An all-clover association before the introduction of grasses was found to be a sound practice for building up soil fertility.

[619] 633.2.03-1.557

'T HART, M. L. **[Yield variation of grasslands in Holland.]** *Maandbl. LandbVoorlD.* 4, 1947 (306-315). B.A. BIII, 1948 (317). [Du.]

A value for the net yield of grassland can be obtained by use of the number of cattle supported in relation to the starch equivalent of the grass; on most farms the net yield would probably be 50-80% of the gross yield. From an experimental survey in Holland it is apparent that 10% of grassland is non-productive because of dykes, ditches, etc., and that even with similar manuring the different areas showed great differences. In the 3 years of the test reported, up to 15% of the variations were due to weather; probably other responsible influences are soil characteristics, amounts of fertilizers, drainage and botanical composition. For clay soils, drainage and the amount of fertilizer seem to be the most prominent factors; for peaty soils, fertility rather than amount of fertilizer is important; sandy soils are most affected by organic content, age and water level.

[620] 633.2.03-1.557

GERICKE, S. **[Effect of growth factors on crop yield from meadows and pastures. I. Meadows.]** *Deut. Landw.* 2, 1948 (1-5). B.A. BIII, 1948 (316). [G.]

The results of more than 5000 experiments on the effects of soil type, N, P, K and Ca contents, soil reaction, weather and fertilizers on yield of hay are reviewed.

[621] 633.2.03-1.582
LOBANOV, P. P. **[Rôle of the grassland farming system in increasing the agricultural productivity of the U.S.S.R.]** *Sovet. Agron.* No. 11, 1948 (30-44). [R.]

The principal factors in the grassland-farming system are: the introduction of correct field- and forage-crop rotations incorporating the sowing of perennial seed mixtures of legumes and Gramineae and the use of bare fallows; a system of windbreaks round fields; afforestation of gullies and ravines; the use of a correct system of soil cultivation in grassland rotations with the application of fertilizers; construction of a system of ponds and reservoirs in gullies and hollows and the sowing of varieties of field crops that are best adapted to local conditions. The principal feature of the system is the grass rotations. The bare fallows and the early fallows are an essential part of the rotations owing to their importance in weed control and in accumulation of soil moisture. One of the most important factors of the grassland farming system is the planting of windbreaks round fields to improve the water regime of the soil and to regulate the accumulation and distribution of snow in fields. Results obtained in the central chernozem belt have shown that the combination of windbreaks together with the network of ponds has considerably altered the micro-climate in the fields of the Institute. Wind velocity has diminished under the influence of the windbreaks by 30-40% as compared with the open steppe and the relative humidity has increased by 3-5%. In 1946, a year of drought, fields protected by windbreaks gave yields of 13.7 centners/ha. of spring wheat as compared with fields where the yields were only 1.5-2 centners/ha. It was also found that soils of leys, after only 2-4 years under grass, contained up to 80% of structural aggregates which was almost as much as in natural grassland.

[622] 633.2.03-1.582
URVÁLEK, J. Význam pastvin v plānovanēm použitı půdy. **[The significance of pastures in the planned utilization of the soil.]** *Věst. Čsl. Akad. Zeměd.* 22, 1948 (500-508). [Cz.r.e.]

A general discussion on the value of pastures for increasing soil fertility. In dry regions grassland should be left undisturbed, but in regions such as Czechoslovakia with sufficient precipitation and fertile soils ley farming should be encouraged.

[623] 633.2.03-1.587 : 581.5
WOERDT, D. v. D.; VRIES, D. M. DE De botanische samenstelling van uiterwaarden en overeenkomstige binnendijks gelegen gronden. **[The botanical composition of water meadows lying between the dykes and the river and of comparable grasslands situated within the dykes.]** *Landbouwk. Tijdschr.* 60, 1948 (584-590). [Du.e.]

The data suggest that the botanical composition of the grasslands lying within the dykes might be improved by liming, manuring and good management.

[624] 633.2.03-1.81 : 581.192
THOMAS, B.; THOMPSON, A. **The ash-content of some grasses and herbs on the Palace Leas hay plots at Cockle Park.** *Emp. J. Expt. Agric.* 16, 1948 (221-230). [King's Coll., Newcastle-upon-Tyne]

The ash constituents of 3 grasses and 4 miscellaneous herbs were examined. In general the broad-leaved plants were more efficient as sources of Ca and P and markedly superior to grasses in their content of trace elements. Treatment with basic slag or complete fertilizer such as is frequently applied to meadow land increased the major mineral elements, but depressed Fe, Mn and Co contents. Relatively high pH is probably responsible for the small uptake of Fe and Mn. Farmyard manure increased P content and amounts of one or two trace elements only. Treatment with muriate of potash depressed the Ca in most species; the K content was higher than when complete fertilizer containing the same weight of muriate of potash was applied: Na and Fe contents were low and Mn content high. Applications of P fertilizers increased the P content and depressed the Co content.

As changes in manurial practice seem unlikely to increase the all-round efficiency of the sward, the only practical means is to encourage the growth of individual species known to contain large amounts of trace elements.

[625] 633.2.03-1.83 : 581.5
ODLAND, J. E. **Better hay with potash.** *Better Crops* 32, 1948 (6-8, 41).

Results obtained at New England experiment stations have shown the necessity for an ample supply of K_2O to be applied to legume-grass mixtures in order to maintain the stand of legumes, including lucerne, in these mixtures. On a plot where only small amounts of K_2O had been applied for many years the average legume content was only 2% and the yield was only 1.17 tons/acre. On the plot receiving 100 lb./acre of K_2O the yield was 3.79 tons/acre with an average content of 57% of legumes. On the low-K_2O plots clovers had practically disappeared by the end of the second year of the test. For the last 3 years lucerne was the only remaining legume and this had nearly disappeared on all plots except those receiving 100 lb./acre of K_2O.

[626] 633.3-1.531-2.951
PEDERSON, C. E. **Insecticides increase legume seed.** *Mich. Agric. Expt. Sta. Quart. Bull.* 30, 1948 (298-308).

DDT, benzene hexachloride and chlordane alone or in combinations all increased yields. Some plots treated with DDT showed marked increases in vegetative growth and degree of blooming; these plants reached maturity before those in the untreated areas. Applications should not be made when the plants are in bloom because these insecticides are toxic to pollinating insects.

[627] 633.3-1.811.7
CONRAD, J. P.; HALL, H. L.; CHAUGULE, B. A. **Sulfur fertilization of legumes in the Upper Ojai Valley, California, and the resulting effects on the following nonlegumes.** *Proc. Soil Sci. Soc. Amer. 1947*, 12, 1948 (275-277). [Univ. Calif. U.S.D.A., Ventura]

Certain soils in the Upper Ojai Valley are derived from parent rock which contains strata with a pronounced reddish rather than the usual brown colour. Application of S to ranges in these areas resulted the first year in a three- to fourfold increase in legumes, especially *Medicago hispida*. In the following years yields of nonlegumes, including barley, were increased up to double the yields of the unfertilized plots. Soils derived from the browner rocks failed to give such responses.

[628] 633.3-1.811.9
RICEMAN, D. S. **Mineral deficiency in plants on the soils of the Ninety-mile Plain in South Australia. 2. Effect of zinc, copper and phosphate on subterranean clover and lucerne grown on Laffer sand, near Keith.** *Aust. Counc. Sci. Indust. Res. Bull.* 234, 1948, pp 45.

Subterranean clover, lucerne and *Phalaris* behaved quite differently in response to various manurial treatments. Subterranean clover responded to the inclusion of Cu and Zn in the super. dressing applied at seeding provided the super. dressing was not a heavy one. Lucerne yield was enhanced by Cu but not by Zn. *Phalaris* responded to super. but not to Zn or Cu. Increasingly heavy dressings of super. were deleterious for subterranean clover, but were beneficial for lucerne. By varying the type and quantity of fertilizer applied at seeding, the uniform seed mixture sown on all plots gave rise to pastures of distinctly different composition during the second and third years. According to the results of these experiments subterranean clover and lucerne should not be sown together as their manurial requirements are in marked contrast.

[629] 633.326-1.811
RICEMAN, D. S.; POWRIE, J. K. **Mineral deficiency in plants on the soils of the Ninety Mile Plain in South Australia. 3. Differences in the behaviour of the Dwalganup and later-flowering varieties of subterranean clover.** *J. Aust. Inst. Agric. Sci.* 14, 1948 (138-140). [C.S.I.R., S. Australia]

The Bacchus Marsh variety of subterranean clover was highly productive when Zn, Cu and a limited quantity of super. were applied to the soil, but the Dwalganup variety remained unproductive with similar applications. The Dwalganup variety may persist, but be unthrifty, under conditions where the Bacchus Marsh variety fails on account of Zn and Cu deficiency. It is suggested that satisfactory development of the Dwalganup variety on these poor soils depends on the addition of exceptionally heavy dressings of super. as well as of Zn and Cu. Evidence suggests that impurities in super. are not responsible for the effects observed.

[630] 633.34-1.5
BALDONI, R. Prove sperimentali sulla coltivazione della soia. **[Experiments on cultivation of soya.]** *Ann. Sper. Agrar. Roma, n.s.* 2, 1948 (603-642). [I.e.]

Leading features of 68 named varieties of soya are listed. Tests of these varieties were made at several places in Italy. The trials included rate of sowing, and effects of inoculation, placed super. and other factors on main crops; the possibility of taking soya as an irrigated catch crop was also investigated. Little difference emerged from the rate-of-sowing and other cultural trials except that early (April) sowing was clearly advantageous. Yields of beans were on the whole low and depended greatly upon weather; as a forage crop soya proved much inferior to maize. Varieties suited to various conditions are tentatively indicated for further trial, but the opinion is expressed that the opening for soya in Italy is limited to sub-acid soils where other legumes do not grow easily; on such soils maize will likely be a more economic crop.—R.N.

[631] 633.34-1.5
STRAND, E. G. **Soybeans in American farming.** *U.S.D.A. Tech. Bull.* 966, 1948, pp. 66. [Bur. Agric. Econ.]

Recent increases in acreages of soybeans in U.S.A. have been for beans for processing. Soybeans are grown in the Corn Belt, the Mississippi Delta and the Atlantic Coast States. On level land, they have a beneficial effect on the soil and on succeeding crops. Danger of soil erosion limits their cultivation on slopes.

[632] 633.364-2.192 : 546.711
MORRIS, H. D.; PIERRE, W. H. **The effect of calcium, phosphorus and iron on the tolerance of lespedeza to manganese toxicity in culture solutions.** *Proc. Soil Sci. Soc. Amer. 1947,* 12, 1948 (382-386). [Iowa Agric. Expt. Sta., Ames]

The effect of various concentrations of Ca, P, Fe and Mn on Mn toxicity to lespedeza was studied. Lespedeza grew well at pH 4.6 with Ca as low as 12 p.p.m. at the low-Mn level of 0.1 p.p.m. Mn concentrations of 5 p.p.m. were extremely toxic at all Ca levels up to 300 p.p.m. Mn toxicity was increased by increasing the phosphate present from 2 to 20 p.p.m. An increase in Fe concentration up to 1 p.p.m. markedly reduced the toxicity of a given Mn level, but Fe at 2.5 p.p.m. decreased growth at all Mn levels. Good growth was obtained over a wide range of Fe : Mn ratios. The good effect of Fe was due to a decrease in the Mn absorbed by the plant rather than to an increase in Fe absorption.

[633] 633.379
HENAO DUQUE, A. El kudzu tropical. **[Tropical kudzu.]** *Agric. Trop. Bogotá* 4, No. 8, 1948 (15-21). [Sp.]

The qualities of tropical kudzu as a pasture plant and in soil conservation and regeneration are discussed in outline. It should be of great future value in Colombia.

633.4 ROOT CROPS

[634] 633.4-1.5
NOWOSAD, F. S.; MACVICAR, R. M.; RIPLEY, P. O. ET AL. **Field roots.** *Canada Dept. Agric. Pub.* 672, *Farm. Bull.* 88, 1948, pp. 29.

Recommendations made include those for climate, soils, crop rotation, cultivation, fertilizers and production of seed, for carrots, mangolds and swedes.

[635] 633.42-1.84
COCHRAN, H. L. **Effects of fertilizer and method of application of supplementary nitrogen on the yield of turnip greens for canning.** *Proc. Amer. Soc. Hort. Sci.* 50, 1947 (321-324). [Pomona Products Co., Griffin, Ga.]

Varying amounts of an 8-8-6 fertilizer mixture were applied before planting, and optimum results were obtained with 1500-2000 lb./acre. 150 lb./acre of $NaNO_3$ or its equivalent in N is recommended in central Georgia as a top-dressing when the plants reach a height of approximately 2 inches.

633.491 POTATOES

(*See also* Abs. Nos. 564, 736)

[636] 633.491-1.5
HOUGHLAND, G. V. C.; PARKER, M. M. **A study of three factors in potato production: Row spacing, seed spacing, and fertilizer rate.** *Amer. Potato J.* 25, 1948 (393-406). [Bur. Pl. Indust., U.S.D.A. and Va. Truck Expt. Sta., Norfolk]

Largest financial returns were obtained from seed spaced 15 or 18 inches in rows 36 inches apart and from 2000 lb./acre of 5-10-5 fertilizer containing 255 lb./ton of dolomitic limestone. The average weight of tubers was increased when the seed was planted further apart or when the rows were more widely spaced.

[637] 633.491-1.51

BRASHER, E. P. **The effect of plowing and discing soils on the yields of tomatoes, muskmelons and potatoes.** *Proc. Amer. Soc. Hort. Sci.* 51, 1948 (357-358). [Delaware Agric. Expt. Sta. Newark]

Yields of muskmelons and potatoes from the ploughed areas were significantly greater than from the disced areas. Tomato yields did not show the same difference although they slightly favoured the ploughed areas. As chemical analyses of the soils showed no reason for this difference between the two areas, the advantage of the ploughed areas is ascribed to physical conditions, it being possible that better aeration and moisture existed in the ploughed areas. The tomatoes were grown at the beginning of the experiment when the physical condition of the plots was fairly equal.

[638] 633.491-1.544.7

TERMAN, G. L.; LIBBY, W. C.; JUNKINS, S. C. **Applying mulch for potatoes.** *Amer. Fert.* 109, No. 7, 1948 (28).

Light mulching of land after potatoes are planted maintains soil-organic matter so that potatoes can be grown every year on the better land. The mulch crop should be grown on the poorer land where need for cultivation may be eliminated by chemical weed control. Unchopped green grass and clover mulches spread at the rate of 3 and 5 tons/acre when plants were emerging increased yield slightly. Covering the soil with heavy paper or sawdust reduced the amount of moisture entering the soil from rain and decreased the yield 80-90 bushels/acre. Partly-rotted straw, unchopped green grass and clover mulches, applied after potatoes had been ridged once, all increased yield considerably; sawdust decreased yield. Extra N broadcast with the mulch at 60 lb./acre further increased yield of potatoes mulched with grass but not those mulched with clover.

[639] 633.491-1.81

BERGER, K. C. **Soil fertility investigations with potatoes in Wisconsin.** *Amer. Potato J.* 25, 1948 (377-386). [Univ. Wisc., Madison]

Analyses show that when potatoes are grown on Northern-Wisconsin soils for 10-30 years the available-P and soluble-Mn content and acidity are increased, while the available-K, -Ca and -Mg contents are seriously depleted. On 9 fields in 7 years one application of 800 lb. of 3-12-12 in the row increased the average yield over the unfertilized by about 60 bushels/acre. The additional application of 1200 lb. of 6-6-18 gave a further increase of 80 bushels. In soils below pH 5 finely ground dolomitic limestone should be applied to add available Ca and Mg to the soil and to reduce the excess amounts of soluble Mn present in some of these soils. Soluble Mg is frequently added in the fertilizer in addition to that provided in the limestone. Mn toxicity and Mg deficiency are quite common in these soils.

[640] 633.491-1.81

SLIJCKEN, A. VAN Onderzoek naar de invloed van de minimumwet bij de bemesting van aardappelen. [**Investigation of the effect of the law of minimum in the manuring of potatoes.**] *Meded. Landb-Hoogesch. Opzoekingssta. Gent* 13, 1948 (79-112). [Du.f.e.] [Rykssta. Plantenver. Melle]

In a 2-year experiment with 2 varieties of potato on a clay loam, treatments comprised no fertilizer, NPKCa, PKCa, NPCa, NPK and NPKCaMg. Amounts of each fertilizer applied per ha. were: 250 kg. of 20% $(NH_4)_2SO_4$, 500 kg. of 15% super., 250 kg. of 48% K_2SO_4, 1000 kg. of $Ca(OH)_2$ and 1000 kg. of magnesia-lime containing 25% MgO and 35% CaO. The lime was applied to the preceding grassland, and the other fertilizers just before planting. Yields from the various treatments decreased in the order: NPKCaMg, NPKCa, NPK, NKCa and PKCa, nil and NPCa. The no-K treatment caused early maturing and abnormally dark green leaves, decreased the proportion of large to small tubers and increased the dry-matter content. Treatments including Ca and Mg gave insignificant increases in yield.

[641] 633.491-1.81
HANLEY, F. **Nutrition of farm crops. III. The nutrition and manuring of potatoes.** *Farming* 2, 1949 (11-15).

Manuring depends not only on soil type and climate, but also on whether early or late varieties are grown. Farmyard manure reduces the need for fertilizers, but by a less degree than is usually supposed, as it increases the potential yield of the land and enables the crop to use more plant food. The potato crop will give a better return for moderate dressings of farmyard manure than any other farm crop. Fertilizers give better results when broadcast over ridges before planting than when worked into the ground when ridging.

[642] 633.491-1.84 : 581.192
VOLKART, A. Der Einfluss steigender Stickstoffgaben auf den Saatgutwert der Kartoffeln. **[The influence of increasing nitrogen applications on the quality of seed potatoes.]** *Landw. Jahrb. Schweiz* 62, 1948 (83-95). [G.f.]

48 trials carried out in different localities in Switzerland showed that the application of N in amounts up to 90 kg./ha. in addition to stable manure had no significant effect on the quality of seed potatoes.

[643] 633.491-1.86-1.81
HANSEN, F. Gødningsforsøg paa Forsøgsstationen ved Studsgaard 1937-44. **[Manuring trials at the Studsgaard Research Station 1937-44.]** *Tidsskr. Planteavl* 51, 1948 (500-527). Hort. Abs. 18 (199).

In manurial trials on light sandy soil with potatoes in a 4-year rotation, one application of 36 tons/ha. of stable manure + 12 tons/ha. of liquid manure in 4 years was compared with an equal amount of nutrients applied as artificial fertilizer made up of 1500 kg. of nitrate or 1200 kg. of $(NH_4)_2SO_4$, 750 kg. of super. and 750 kg. of 40% K salt. Artificial fertilizers gave higher yields of potatoes. In a trial in which stable manure was compared with manure + artificial fertilizer, the latter gave the greater yields.

[644] 633.491-2.192 : 546.711
BERGER, K. C.; GERLOFF, G. C. **Manganese toxicity of potatoes in relation to strong soil acidity.** *Proc. Soil Sci. Soc. Amer. 1947*, 12, 1948 (310-314). [Univ. Wis., Madison]

Stem-streak necrosis due to Mn toxicity is common in some northern Wisconsin soils whose pH has been allowed to drop lower than 5.0 in order to control scab. As little as ·2 p.p.m. of soluble Mn in nutrient solutions caused severe necrosis. The application of lime to maintain a soil pH of 5.0-5.3 is the most practical means of preventing the necrosis.

[645] 633.491-2.2-2.953
SCHMITT, C. G. **Chemicals for control of the golden nematode of potatoes.** Abs. in *Phytopath.* 38, 1948 (23).

In a pot test, 23 gallons/acre of allyl bromide, DD, trimethylene bromide, ethylene bromide and Iscobrome D were all effective in killing cysts of the golden nematode. Under similar conditions at 76 gallons/acre, only ethylene dibromide and Iscobrome D eradicated the parasite.

[646] 633.491-2.951 : 581.192
WOLFENBARGER, D. O.; DECKER, P.; RAWLINS, W. A. **Off-flavor of potato tubers produced by benzene hexachloride used for wireworm control.** *Amer. Potato J.* 25, 1948 (413-417). [Fla. Agric. Expt. Sta., Gainsville, and Cornell Univ.]

There were wide variations in abilities of tasters to detect off-flavour in potatoes from soil applications, fertilizer combinations or seed-piece treatment with benzene hexachloride.

633.5 FIBRE CROPS

(*See also* Abs. Nos. 407, 435, 580)

[647] 633.51-1.4 : 551.577
POORNAPREGNA, V. N.; NARAYANAYYA, D. V. **Response of the cotton crop to soil types in Warangal Subha.** *Indian Cott. Grow. Rev.* 2, 1948 (130-139). [Pl. Breeding Sta., Latur and Cott. Res. Sta., Nanded, Hyderabad]

As good crops of cotton can be grown on *chalka* as on *regur* soils, and yield is generally determined on both soils by the quantity of rainfall in July-August. Rainfall of 18-22 inches in July-August is favourable to cotton on *chalka* soil, and 8-11 inches is conducive to high yields on *regur* soil. Low yields on *regur* in years of heavy rainfall are due to root rot in July and the shedding of early buds in August.

[648] 633.51-1.84
PADEN, W. R. **Response of cotton and changes in chemical properties of soil from continuous use of various sources of nitrogen fertilizers.** *Proc. Soil Sci. Soc. Amer. 1947*, 12, 1948 (289-293). [S.C. Agric. Expt. Sta., Clemson]

A total of 15 sources of N were used, 11 of them for 20 years and 4 for 14 years or over on once-limed and unlimed Cecil sandy loam. The results indicate that sources such as Ammophos and $(NH_4)_2SO_4$ may reduce the amount of exchangeable Ca, especially in sandy soils, to the extent that Ca deficiency is likely to occur. Soils receiving sources such as $Ca(NO_3)_2$, Ca cyanamide and $NaNO_3$ had higher exchangeable-Ca and lower exchangeable-H contents. Seed-cotton yields from the various sources should not differ greatly if sufficient Ca is applied with the N source or separately as lime, provided that excessive leaching of the nitrate form does not occur.

[649] 633.51-2.4-1.671
KING, C. J.; BRINKERHOFF, L. A. **The dissemination of *Xanthomonas malvacearum* by irrigation water.** *Phytopath.* 39, 1949 (88-90). [U.S. Field Sta., Sacaton, Ariz.]

A series of experiments on irrigation of cotton showed that both surface and sprinkling methods may be effective in disseminating *Xanthomonas malvacearum*.

[650] 633.51-2.953
SMITH, A. L. **Control of cotton wilt and nematodes with a soil fumigant.** *Phytopath.* 38, 1948 (943-947). [U.S.D.A. and Ala. and Ga. Agric. Expt. Sta.]

Dowfume W-10, which consists of approximately 10% of ethylene dibromide and 90% of naphtha B, was injected at a rate of 31 gallons/acre to a depth of 6 inches in a moderately infested, sandy loam. Use of the fumigant slightly reduced the number of cotton seedlings planted 5 days after the soil treatment, but increased yields and almost completely controlled wilt and root-knot. Similar results were obtained from the use of 37 gallons/acre on heavily infested soil but the most economical rate was 12.5 gallons/acre.

[651] 633.52-1.81
WILSON, A. S. B.; CATTO, G. A.; MEIKLEJOHN, A. K. M. **Linseed trials 1948.** *Scott. Agric.* 28, 1948-49 (150-154).

In the east of Scotland all trials showed a response to N dressings when a basic dressing of 2-3 cwt. of super. and ½-1 cwt./acre of muriate of potash was applied; ½-1 cwt. of $(NH_4)_2SO_4$ was a suitable dressing. In the north of Scotland a moderate application of a complete fertilizer should be safe. In the west of Scotland adequate P and K are necessary together with a limited amount of N. Linseed should not be grown on soils short of lime.

[652] 633.52-2.954
GRANHALL, I.; ZIENKIEWICZ, H. Inverkan av olika ogräsbekämpningsmedel på skördeutbyte och kvalitet hos spånadlin. **[The effect of different weedkillers on yield and quality of flax.]** *Växtodling* 3, 1948 (65-73). [Sw.e.]

All the chemicals tested (by spraying) were injurious to fibre quality. Damage was greatest from hormone derivatives, then from sulphuric acid, then from copper salts and dinitro-orthocresols. The fibre content was also decreased to a greater extent than the total yield was increased.

[653] 633.525.1-1.5
TOXOPEUS, H. J.; BERG, H. A. VAN DEN Enkele gegevens over de cultuur van ramie. **[The cultivation of ramie.]** *Landbouw* 20, 1948 (117-125). Hort. Abs. 18 (225). [Du.]

Climate, planting, manuring, pests, diseases, harvesting and processing are discussed.

633.6 SUGAR CROPS

(*See also* Abs. Nos. 368, 563, 587, 776, 788)

[654] 633.61-1.42
CLEMENTS, H. F. **Crop logging sugar cane in Hawaii.** *Better Crops* 32, 1948 (11-18, 45-48). [Hawaii Agric. Expt. Sta.]

Crop logging, a graphic record of the crop's progress, is considered essential for sugar production in Hawaii, as production is mostly governed by atmospheric conditions, and general cultural requirements vary for any two crops grown in the same field. Under these conditions soil analysis and field experiments have not been particularly useful for determining sugar-cane fertilizer needs. The routine for crop logging is to sample the crop every 35 days. The entries in the crop log

include: temperature and sunlight, elongation and growth-potential records and the N, moisture, primary and K and P indices, which are all determined on the tissues of the cane plant. The young leaf sheaths were chosen as the index tissue for total sugars (the primary index), moisture and all the ash constituents. The green photosynthetic tissue of the middle third of the young blades was chosen as the index tissue for N. The green weight of the young sheath sample served as an index of the general vigour of the plant. Under irrigation the first samples from the field will, if the crop is making satisfactory progress, show moisture and N indices high, K and P indices normal, and the primary index low. The log serves as a running check on crop growth and therefore on the operations affecting this growth. The difficulty of ripening sugar cane under irrigation has been overcome by the development of a method, following study of the crop logs, whereby crops are classified according to their moisture levels, the irrigation being adjusted to the need of each crop. The crop log has shown that the moisture level of a crop is the most important factor influencing its development; it also dictates the time of fertilizer application and predicts the quantity of fertilizer to be applied.

[655] 633.62-1.582
INDIAN FARMING. **Effect of *jowar* and maize on succeeding crops.** *Indian Farm.* 9, 1948 (298-299). [Indian Agric. Res. Inst. Delhi]

Maize or *jowar* appears to interfere with the accumulation of total and available N in the soil. The interference can be at least partially overcome by including a legume in the rotation, increasing the interval between maize or *jowar* and wheat or barley and applying large amounts of a mixture of organic and inorganic N manures.

[656] 633.63-1.3
ARMER, A. A.; CANNON, R. M.; REEVE, P. A. **The 1947 mechanical harvesting of sugar beets.** *Agric. Engng.* 29, 1948 (482-484).

The 3 authors discuss the harvesting in (1) California (2) the intermontane area and (3) the eastern sugar-beet area. In (1) an area of about 100,000 acres or 69% of the crop was mechanically harvested; in (2) 130,000 acres or 21% of the crop and in (3) about 8500 acres. An outline account is given of the performances of the types of harvesters used in the different localities and of the remaining problems, mainly due to weeds and weather, hindering complete mechanization.

[657] 633.63-1.3
BLACKWELDER, E. F. **Development of the Marbeet sugar-beet harvester.** *Agric. Engng.* 29, 1948 (481).

The towed Marbeet harvested 100,000 acres in California in 1947. The principles of its operation, the development of the tractor-mounted Marbeet Midget for use where the average acreage per grower is less than in California, and the development of a sugar-beet top-recovery programme are discussed in outline.

[658] 633.63-1.3
HIPPLE, J. L. **The International sugar-beet harvester.** *Agric. Engng.* 29, 1948 (480).

New incorporations in a type already on the market.

[659] 633.63-1.332
BARMINGTON, R. D. **The relation of seed, cell size and speed to beet planter performance.** *Agric. Engng.* 29, 1948 (530-532).

Data for several commercial plate planters on the effect of seed size, planter-plate speed and size on cell fill and seed damage.

[660] 633.63-1.332
MCBIRNEY, S. W. **The relation of planter development to sugar-beet seed emergence.** *Agric. Engng.* 29, 1948 (533-536).

The results of studies to improve the percentage and uniformity of seed emergence by planter development are discussed and recommendations concerning planter use and design are made.

[661] 633.63-2.4-1.85-1.436
WARREN, J. R. **A study of the sugar beet seedling disease in Ohio.** *Phytopath.* 38, 1948 (883-892). [Ohio Agric. Expt. Sta.]

Isolation of the organisms within the tissues of diseased sugar-beet seedlings indicated that the fungus primarily responsible for black-root disease is *Aphanomyces cochlioides* Drech. Experiments with seeds sown in sterilized clay soil which was mixed with cultures of the pathogen and treated with super. at rates of 400 and 500 lb./acre showed that at soil temperatures of 28° and 32°C. P was ineffective in reducing black-root, but at 18, 20 and 24° caused a marked reduction in the number of diseased seedlings.

[662] 633.63-2.4 : 633.31
BUCHHOLTZ, W. F. ***Aphanomyces cochlioides* infestation in irrigated sugar beet-alfalfa rotation plots at Newell, South Dakota.** Abs. in *Phytopath.* 38, 1948 (4).

Aphanomyces cochlioides was abundant in plots in a 4-year rotation of beets-oats and alfalfa-alfalfa-alfalfa. Plots with 4-year rotations of potatoes or wheat in place of sugar beet were free of the fungus. The continuous-beet plot without added manure or fertilizer was infested, but not so heavily as plots in the 4-year alfalfa-beet rotation. A beet plot with added P and another with added manure were apparently free of the fungus, but non-fertilized plots planted to beets alternating with potatoes or oats were infested. Plots planted continuously to alfalfa, potatoes, wheat, barley, oats or maize and plots in 3-year beet rotations without legumes were free. Soil infestation was apparently initiated by crops of beet, but was much favoured by abundance of alfalfa, a non-host crop, in the rotation.

633.7 STIMULANTS

(See also Abs. Nos. 763, 764)

[663] 633.71-1.84 : 581.192
EVANS, H. J.; WEEKS, M. E. **The influence of nitrogen, potassium and magnesium salts on the composition of burley tobacco.** *Proc. Soil Sci. Soc. Amer. 1947*, 12, 1948 (315-322). [Ky. Agric. Expt. Sta., Lexington]

The effects of NH_4-N and NO_3-N were compared in sand cultures supplied with solutions of pH 5.8 and of constant nutrient content, except for Mg and K (as KCl or K_2SO_4) which were supplied in different amounts. In the NO_3 series plant growth was much better and Ca, Mg, Mn, nicotine, total sugars and citric, malic and total organic acids were higher. In the NH_4 series K, Fe, P, nitrogen constituents except nicotine, and pigments were higher. In both series, pigments were higher in plants receiving additional Mg and were very low in the culture receiving no Mg. The ammonia-N content was extremely high in all NH_4 cultures, especially those receiving K as KCl. Nicotine was low in the series receiving no Mg. The N constituents were lower and the carbohydrates higher in the bottom than in the top leaves of the plants.

[664] 633.71-2.2-2.953
KINCAID, R. R.; VOLK, G. M. **Soil fumigation for cigar-wrapper tobacco in Florida.** Abs. in *Phytopath.* 39, 1949 (11).

Dowfume W-40 (ethylene dibromide) at 15 gallons/acre and D-D at 23 gallons/acre were applied either 6, 4 or 2 months before transplanting tobacco. Best control of root knot was given by the earliest application and D-D was more effective than Dowfume W-40. Control of nematode root rot was not as good as control of root knot. There was a prolonged retention of NH_3 in the soil after fumigation.

[665] 633.71-2.953/4
CLAYTON, E. E.; GAINES, J. G.; GRAHAM, T. W. ET AL. **Soil treatments with chemicals for the control of tobacco parasites.** Abs. in *Phytopath.* 39, 1949 (4-5).

Plant-bed treatments with chemicals such as $CaCN_2$ and $CO(NH_2)_2$ are well established for the control of weeds and diseases in the flue-cured tobacco areas. Promise is shown by $Ca(NO_2)_2$ and KNO_2 as herbicides, nematicides and fungicides, by NaN_3 as a nematicide and fungicide, and by allyl alcohol as a herbicide. Combinations of $CaCN_2$ and NaN_3, and of allyl alcohol and ethylene dibromide controlled weeds and root knot effectively. In field experiments D-D and ethylene dibromide gave good commercial control of nematodes, but heavy reinfestation occurred by the end of the current crop year. The incidence of sore skin (*Rhizoctonia*) was unaffected, but in one experiment D-D gave excellent control of *Sclerotium rolfsii*. On treatment of severe nematode infestation, up to 50% increase in the yield of cured leaf was obtained.

[666] 633.73-1.466.1-1.875
HOWARD, A. El abonamiento del cafeto. **[Manuring coffee.]** *Rev. Inst. Def. Café Costa Rica* 18, 1948 (505-507). Hort. Abs. 18 (223).

Repeated applications of fresh compost made with animal excreta by the Indore process favours the development of a mycorrhizal association in coffee.

[667] 633.73-1.5
GEORTAY, G. Note sur quelques expériences culturales relatives au caféier robusta. [**Note on some cultural experiments with robusta coffee.**] *C.R. Sem. Agric. Yangambi* 1947 (440-447). Hort. Abs. 18 (222).

Establishment of coffee plantations after thinning the forest cover, clearing without burning, and clearing with burning are compared. Early results indicate advantages of burning. Mulching increased yield insignificantly, but unmulched coffee with a controlled leguminous cover crop gave increased yields. Yields were increased by burying forest leaves in one trench per bush, but the practice was uneconomic.

[668] 633.73-1.5
POSKIN, J. H.; THIRION, F. Méthodes culturales propres à assurer la protection du sol dans les caféiers. [**Cultural methods of protecting soil under coffee.**] *C.R. Sem. Agric. Yangambi* 1947 (431-435). Hort. Abs. 18 (223).

After the forest has been felled, rides 3½-4 metres wide are opened every 7 m. and the debris is heaped up between the coffee which is planted at a density of 930/ha. Although in the first 4 harvests the yield is 25% less than from coffee planted 3 m. × 3 m. (1090/ha.) after burning, the difference can be reduced by interplanting a further 300-350 trees 4 years after clearing and the coffee bushes remain in better condition. Unrestricted growth of coffee with no pruning helps to protect the soil. Clean weeding must be avoided and shade is desirable.

[669] 633.75-1.5
BAGGE, H. Kulturforsøg med Opiat-Valmue 1941-1946. [**Cultural trials with opium poppy 1941-1946.**] *Tidsskr. Planteavl* 51, 1948 (587-615). Hort. Abs. 18 (208).

The best sowing date in Denmark is about 1st April. The optimum distance between rows is 40-45 cm. on loam soil and 60 cm. on sandy soil. 2 kg./ha. should be sown and the plants thinned, when the first true leaves appear, to 25 plants per metre of row.

633.8 AROMATIC, MEDICINAL AND OIL PLANTS

(*See also* Abs. Nos. 766, 796)

[670] 633.85-1.582
VACHHANI, M. V. **The effect of the cultivation of oil-seed crops on the soil fertility.** *Curr. Sci.* 17, 1948 (300). [Agric. Res. Sta. Dokri, Sind]

The basic crops *torio*, sarson (both brassicae) and wheat were grown in three sets of experiments during the *rabi* season with fallow as the control. Cotton, *jowar* and wheat were grown in the same area in different sets in order to gauge the exhausting effect of the previous crops on soil fertility. Oil seeds had no adverse effect on the yield of succeeding crops and can be included in a regular crop rotation. Yields were highest after fallow and lowest after wheat. For shallow-rooting crops like *jowar* or wheat a previous fallow is unnecessary.

[671] 633.852.52-1.811
STRAUSS, J. L.; GRIZZARD, A. L. **The effect of calcium, magnesium and potassium on peanut yields.** *Proc. Soil Sci. Soc. Amer.* 1947, 12, 1948 (348-352). [Va. Agric. Expt. Sta., Blacksburg]

The studies aim to contribute towards an explanation of the inconsistent response of groundnut yields to applied fertilizers, especially K, dolomitic limestone and combinations of these. Studies on 10 fields of 5 soil types showed that the percentage Ca saturation of the exchange complex was correlated with the average weight of a nut produced by a plant and that the K:Mg ratio of the soil was correlated with the number of nuts per plant. Combination of the values of the percentage Ca saturation and the K:Mg ratio gave a product indicative of the relative yield of marketable nuts.

The Ca:organic-matter ratio was highly correlated with the average weight of nut and this is of great practical value as the organic-matter content of the soil, determined either visually or in the laboratory, can be used an an indication of the exchange capacity, and thus a criterion is provided for estimating the relative Ca requirements of a given soil to bring the percentage Ca saturation to a greater productive level.

[672] 633.852.52-1.811.4
BRADY, N. C. **The effect of period of calcium supply and mobility of calcium in the plant on peanut fruit filling.** *Proc. Soil Sci. Soc. Amer. 1947,* 12, 1948 (336-341). [Cornell Univ., Ithaca, N.Y.]

Ca was supplied 3 times a week as $CaSO_4$ solution to the quartz-sand fruiting medium, which was separated from the zone of root growth. The highest percentage fill was obtained when Ca was given 15-35 days after the gynophores reached the sand. A supply of Ca in the first 18 days of fruit development also gave a fairly high fill, but Ca given when the gynophores had been 36 or more days in the sand was very ineffective. The fruits nearest the main stem were much more poorly filled than those of comparable age further out on the stems. Gynophore competition for carbohydrates may explain this. Supplying Ca on one side of the plant did not improve either the quality of the fruit or the chemical composition of the plant on the other side.

[673] 633.854.56-1.5
DROSDOFF, M.; FISHER, E. G.; LASSITER, J. H. **Effect of frequency and method of cultivation on the growth of one-year-old tung trees.** *Proc. Amer. Soc. Hort. Sci.* 50, 1947 (115-118). [U.S.D.A., Gainesville, Fla.]

The beneficial effect of cultivation on tree growth was due primarily to the suppression of weeds. Stirring the soil was not important, as flat hoeing was as effective as hoeing and spading. It is doubtful whether moisture or nutrients, usually alleged to be increased by weed control, were of importance in limiting growth in this experiment.

[674] 633.854.56-1.81
BAHRT, G. M.; POTTER, G. F. **Effects of nitrogen, phosphorus, and potassium on growth and yield of tung trees.** *Proc. Amer. Soc. Hort. Sci.* 50, 1947 (137-141). [U.S.D.A., Bogalusa, La.]

N increased growth and yield, but decreased oil content of kernel, which was increased by K. No significant effects on growth or yield were obtained with K. P had no effect on either growth, yield or composition of the fruit.

[675] 633.854.56-1.84
POTTER, G. F.; SITTON, B. G.; MCCANN, L. P. **The effect of different rates of application of nitrogen on biennial bearing in tung.** *Proc. Amer. Soc. Hort. Sci.* 50, 1947 (125-130). [U.S.D.A. Bogalusa, La.]

The level of N fertilizing appeared to have no effect on the alternate-bearing tendency.

[676] 633.854.56-1.842.4-1.816.2
FISHER, E. G.; LAGASSE, F. S.; LASSITER, J. H. **A comparison of winter and spring applications of ammonium nitrate to tung trees.** *Proc. Amer. Soc. Hort. Sci.* 50, 1947 (142-144). [U.S.D.A. Gainesville, Fla.]

The effect of the time of application of supplemental ammonium nitrate appears to be of relatively little importance. In districts with heavy rainfall, early-winter applications of fertilizer would be more likely to result in loss by leaching.

[677] 633.854.56-2.191 : 546.56 : 631.84
HAMILTON, J.; GILBERT, S. G. **The relation of fertilization with copper and nitrogen to copper deficiency symptoms, leaf composition, and growth of tung.** *Proc. Amer. Soc. Hort. Sci.* 50, 1947 (119-124). [U.S.D.A., Gainesville, Fla.]

High levels of N combined with low levels of Cu resulted in severe Cu deficiency. Little Cu deficiency occurred with low rates of N application regardless of the amount of Cu applied, or with high levels of Cu regardless of level of N applied. K decreased Cu-deficiency symptoms slightly; P had no effect.

634 ORCHARDS. FRUIT

(*See also* Abs. Nos. 382, 540, 541, 547)

[678] 634-1.427.3
MERRILL, T. A. **A system aiding diagnosis of nutrient deficiencies in fruit trees (a preliminary report).** *Proc. Amer. Soc. Hort. Sci.* 51, 1948 (48-50).

Description of a pressure tank for direct injection of nutrients into the phloem tissue. Single branches can be treated on trees without apparently showing any effect on the remainder of the tree, and the method is effective in determining possible causes of nutrient deficiencies.

[679] 634.11-1.427.3
BEATTIE, J. M. **Carbohydrates in apple shoots and twigs and their relation to nitrogen fertilization, yield, growth and fruit colour.** *Proc. Amer. Soc. Hort. Sci.* 51, 1948 (33-40). [Cornell Univ., Ithaca, N.Y.]

The differences in N content of the low-and high-N trees were reflected in the twig and shoot carbohydrates and it is suggested that the quantitative determination of starch may aid, in conjunction with other measurements, in the more efficient and profitable use of N fertilizers.

[680] 634.11-1.544.7
LATIMER, L. P.; PERCIVAL, G. P. **Comparative value of sawdust, hay, and seaweed as mulch for apple trees.** *Proc. Amer. Soc. Hort. Sci.* 50, 1947 (23-30).

In the absence of fertilizer, yields were greatest from trees mulched with hay; seaweed-mulched trees were second and sod culture proved the least satisfactory. Hay mulch improved the soil-moisture content, increased the organic-matter content and the amount of available N, P, K and Mg and reduced the amount of soluble Al.

[681] 634.11-1.81
SZAKÁTSY, J. Die Sicherstellung ständiger Erträge bei Apfelbäumen. **[How to ensure annual cropping of apples.]** *Schweiz. Ztschr. Obst. -u. Weinb.* 57, 1948 (4-7, 19-24). Hort. Abs. 18 (171). [G.]

Attempts to overcome biennial bearing of apple trees in Hungary are described. The soil is brown sand interspersed with sandy loam on a subsoil of sandy marl. Biennial bearing does not occur in adult trees to which correct annual applications of fertilizer are made. Heavy applications tend to promote the biennial habit. Fertilizer needs are estimated on the basis of the "bearing tree unit" of a 12-15-year-old tree bearing an average annual crop of at least 100 kg. In 1939 the fertilizer applied per tree unit, partly in February and partly in May, was 1.6 kg. of N, 0.8 kg. of P_2O_5 and 2-4 kg. of K_2O. Variation in yield was moderate except in years of frost and hail.

[682] 634.11-1.81 : 581.192
SPRENGER, A. M.; KUILE, J. TER Bemesting bij Jonathan. **[Manuring the Jonathan apple.]** *Fruitteelt* 38, 1948 (340-341). Hort. Abs. 18 (171).

Fruit quality was improved with increased N, P had no noticeable effect, K improved quality, and increased lime was unfavourable.

[683] 634.11-1.841.7
FISHER, E.; BOYNTON, D.; SKODVIN, K. **Nitrogen fertilization of the McIntosh apple with leaf sprays of urea.** *Proc. Amer. Soc. Hort. Sci.* 51, 1948 (23-32). [Cornell Univ., Ithaca, N.Y.]

3 lb. of urea applied in 3 sprays resulted in slightly better fruit colour than the application of 3 lb. to the soil in spring. Spraying urea in two pre-blossom sprays, a petal-fall spray and a first-cover spray produced the best set and yield. This treatment also produced fruit with almost as good colour as the no-fertilizer control, showing that the effects of sprays of urea N are dependent on the timing of the sprays as well as on the amount.

[684] 634.11-2.191 : 546.27
MULDER, D. Voorlopige mededeling over bestrijding van stip in appels door toediening van borium in de vorm van borax. **[Preliminary report on the application of borax against bitter-pit of apples.]** *Meded. Direct. Tuinb.* 11, 1948 (315-319). Hort. Abs. 18 (178). [Du.e.]

Internal cork is due to B deficiency in the soil. Bitter pit results from Ca accumulation in the apple inhibiting the transport of B in calcareous soils. Application of borax reduced the disease.

[685] 634.13-2.19 : 546.22
OVERLEY, F. L.; ALLMENDINGER, D. F. **The effect of sulfur and sulfuric acid applications upon soil pH values and cork spot development of Beurre d'Anjou pears.** *Proc. Amer. Soc. Hort. Sci.* 51, 1948 (119-122). [St. Coll., Washington, and Southwest Expt. Sta., Vancouver, Wash.]

Concentrated H_2SO_4 applied to a coarse sandy slightly acid loam at approximately 70 ml./square foot over a period of 6 years increased the acidity of the first foot by 1 to 2 pH units, with little effect beyond that depth. Approximately 1 lb. of S applied per square foot lowered the pH value considerably through a depth of 4 feet and this effect persisted 5 years after the application except possibly for the fourth foot. The treatment had no effect on the incidence of cork spot.

[686] 634.21-2.191 : 546.27
BULLOCK, R. W.; BENSON, N. R. **Boron deficiency in apricots.** *Proc. Amer. Soc. Hort. Sci.* 51, 1948 (199-204). [Tree Fruit Expt. Sta., Wenatchee, Wash.]

Fruit malformation in the form of internal browning and corky tissue in the stone area, cracking and constrictions of the fruit and shrivelling and surface browning were corrected by field applications of 0.5 lb. of B per tree. The addition of B increased the B content of the fruit from 9 p.p.m. to as much as 150 p.p.m. The B content of the leaves remained fairly constant.

[687] 634.22-1.4
GARNER, R. J.; HATCHER, E. S. J. **Spacing as a factor governing rooting and growth of hardwood cuttings of the Myrobalan B plum rootstock.** *J. Pomol.* 23, 1947 (149-166). [E. Malling and Imp. Coll. Sci. Tech.]

On 2 soils of contrasting features, a normal loam and a highly specialized lake-bed soil, close spacing resulted in stems of small size with few branches. The plants on the lake soil were more branched than those on the loam, and irrigation of the loam throughout the growing season did not produce the much-branched form of the lake-soil plants.

[688] 634.22-1.67
HENDRICKSON, A. H.; VEIHMEYER, F. J. **Sizes of prunes as influenced by differences in set and irrigation treatment.** *Proc. Amer. Soc. Hort. Sci.* 51, 1948 (235-238). [Univ. Calif., Davis]

Unirrigated trees averaged a larger number of prunes than irrigated trees, but yields from irrigated trees were slightly more than from the unirrigated as the latter did not produce more than 9.5% of the larger sizes, of which the irrigated trees produced a much higher percentage, 69.3% in one case. Unnecessarily large amounts of water did not increase the percentage, but if readily-available moisture is exhausted before the fruits are fully grown, the percentage of large-sized fruit may be markedly decreased.

[689] 634.22-2.192 : 546.27
HANSEN, C. J. **Influence of the rootstock on injury from excess boron in French (Agen) prune and President plum.** *Proc. Amer. Soc. Hort. Sci.* 51, 1948 (239-244). [Univ. Calif., Davis]

The rootstocks had a definite effect on the amount of injury caused by excess B. The least injury was shown in trees on almond root, with those on myrobalan-plum root almost as good. It is recommended that almond rootstocks should be used except where the soil is too heavy or wet, when myrobalan-plum rootstocks should be used.

[690] 634.25-1.417
KENWORTHY, A. L.; GILLIGAN, G. M. **Interrelationship between the nutrient content of soil, leaves and trunk circumference of peach trees.** *Proc. Amer. Soc. Hort. Sci.* 51, 1948 (209-215). C.A. 42 (9026). [Mich. St. Coll., E. Lansing]

Organic C seemed to have the greatest influence on peach-tree nutrition and growth in sandy soils.

[691] 634.25-2.191-1.811.2
VEERHOFF, O. **Phosphorus deficiency of peach trees in the sandhills area of North Carolina.** *Proc. Amer. Soc. Hort. Sci.* 50, 1947 (209-218). [N.C. Agric. Expt. Sta. Raleigh]

P-deficiency symptoms developed only in peach trees set on newly-cleared land that had not received any P fertilizer. Old orchards received a complete fertilizer and P was probably applied in excess of requirements at the rate of 1 lb./tree. Data from both the present work and a South-Carolina experiment showed that 0.1 lb. of P_2O_5 per year was sufficient for a tree in this area for the first 6 years of growth.

634.3 CITRUS

[692] 634.3-1.584
LAWRENCE, F. P. **Cover crops in the citrus program.** *Citrus Indust.* 29, Nos. 6, 7, 19, 1948. C.A. 42 (8396).

A discussion of the physical, chemical and biological aspects of cover crops.

[693] 634.3-2.4-2.953
BLISS, D. E. **Soil disinfestation in citrus orchards against armillaria root rot.** Abs. in *Phytopath.* 38, 1948 (913).

Citrus-root segments inoculated with *Armillaria mellea* were buried at various depths in orchard soils. Charges of CS_2 were applied at 18-inch intervals and killed *Armillaria* in the roots as follows: in coarse

sandy loam, 59 ml. at one foot depth killed at 1-7 feet: 118 ml. at one foot killed at 1-8 feet and 118 ml. at 6 feet killed at 3-10 feet. In fine sandy loam underlain with clay at a depth of 5-6 feet and in sand, 44 ml. at one foot killed at 1-3 feet, and both 59 and 88 ml. at one foot killed at 1-5 feet. Surface charges failed to penetrate the clay substratum.

[694] 634.31-1.84 : 577.16
JONES, W. W.; PARKER, E. R. **Ascorbic acid-nitrogen relations in navel orange juice as affected by fertilizer applications.** *Proc. Amer. Soc. Hort. Sci.* 50, 1947 (195-198). [Calif. Citrus Expt. Sta., Riverside]

There was an overall inverse correlation between N and ascorbic acid in the juice of navel oranges. The amount of N in the juice varied with the amount applied in the fertilizer. The addition of organic matter to those fertilizer treatments providing equal amounts of N per tree annually resulted in a highly significant decrease in N in the juice but had no effect on the ascorbic-acid content.

634.6 PALM FRUITS

[695] 634.61-2
MARTYN, E. B. **West end bud rot or the unknown disease of coconuts.** *J. Jamaica Agric. Soc.* 52, 1948 (88-91). R.A.M. 28 (14).

The disease is not due to deficiency and its occurrence in many varied localities excludes the possibility of a toxic element in the soil.

[696] 634.63-1.4
YANKOVITCH, L.; BERTHELOT, P. Enracinement de l'olivier et des autres arbres fruitiers dans le sud de la Tunisie. **[The rooting habit of the olive and other fruit trees in South Tunisia.]** *C.R. Acad. Agric.* 34, 1948 (774-776). [F.]

Under the local rainfall of 20-30 cm./ year the olive requires a light and permeable topsoil. When the clay content exceeds 8-10% the yields decrease, failing altogether at about 25%. The olive has a great power of exploiting the sub-soil, especially those layers whose clay content exceeds 10%; 15% is about the optimum, but 35% is well tolerated provided the layers are thin and alternate with sandy layers. The roots penetrate in favourable soil to 5 m. at least and spread laterally over about 500 square m. and any excess of soil fertility is harmful in dry regions. Soils with a calcareous crust may be used for olive plantations if the subsoil is suitable, but such soils are always only of the second quality. The limit of tolerance to Cl is approximately reached when NaCl/clay = 1/100.

The almond exploits the lighter layers which the olive roots merely traverse. The fig and the pomegranate have been less well studied but their roots appear to develop in the clayey layers.

[697] 634.653-1.67
MARSH, R. H. **Irrigation of young and old avocado orchards.** *Calif. Avocado Soc. Yrbk.* 1947 (80-84). Hort. Abs. 18 (217).

Water should be applied only when the soil in the upper two-thirds of the rooting region has become dry. Sprinkler, furrow and basin-irrigation methods are described. Water requirements of mature trees vary from 8 to 23 inches per acre per annum or 29,000 to 83,500 cubic feet.

[698] 634.653-1.84 : 581.192
HAAS, A. R. C. **Nitrogen effects on avocado seedlings in soil cultures.** *Calif. Avocado Soc. Yrbk.* 1947 (51-54). Hort. Abs. 18 (217).

Data show growth measurements and chemical composition of leaves, petioles and rootlets of avocado seedlings maintained at concentrations of nitrate N of 25-550 p.p.m.

[699] 634.653-2.4-1.436
ZENTMYER, G. A. **Verticillium wilt of avocados.** Abs. in *Phytopath.* 39, 1949 (26).

Seedling avocados which had been inoculated by dipping the roots in a suspension of spores and mycelium of *Verticillium albo-atrum*, showed wilting and leaf necrosis in 2 weeks at soil temperatures of 15°, 20°, 25° and 30°C. but not at 35°C.

634.7 BUSH FRUITS

(*See also* Abs. No. 583)

[700] 634.711-1.5
DARROW, G. M.; WALDO, G. F. **Raspberry culture.** *U.S.D.A. Farm. Bull.* 887, 1948, pp. 38.

Recommendations made include those for soil preparation, planting and cultivation.

[701] 634.73-1.58 : 577.16
GRIGGS, W. H.; ROLLINS, H. A. **Effect of soil management on yields, growth, and moisture and ascorbic acid content of the fruit of cultivated blueberries.** *Proc. Amer. Soc. Hort. Sci.* 51, 1948 (304-308). [Univ. Conn. Storrs]

The different types of soil management had little effect on the moisture and ascorbic-acid content of blueberries.

[702] 634.73-1.81
SCHWARTZE, C. D.; MYHRE, A. S. **Fertilizer response of blueberry hardwood cuttings.** *Proc. Amer. Soc. Hort. Sci.* 51, 1948 (309-312). [W. Washington Expt. Sta., Puyallup]

Top growth on the cuttings was greatly stimulated by fertilizers, by ammonium phosphate in particular, closely followed by VHPF, a soluble compound said to be a complete plant food, equivalent to a 5-25-15 fertilizer plus vitamins, hormones and minor elements, but much more expensive than ammonium phosphate when used at corresponding N levels. Tankage gave less satisfactory results than those obtained with ammonium phosphate. No detrimental effects of fertilizers, such as had been observed by commercial propagators and others, were noticed.

[703] 634.73-2.954
SMITH, W. W.; HODGDON, A. R.; EGGERT, R. **Progress report on chemical weed control in blueberry fields.** *Proc. Amer. Soc. Hort. Sci.* 50, 1947 (233-237). [Univ. New Hampshire, Durham]

Lime at the rate of 1000 lb. and 2000 lb./acre had no effect on blueberries or sheep laurel. Borax broadcast in September at ½-2 lb./100 square feet had no effect on blueberries. Ammonium sulphamate killed some woody weeds but was particularly toxic to blueberry plants. Sprays of the ammonium salt of 2,4-D and of 2,4-D at 1000 p.p.m. also killed blueberry plants. Sprays of ammonium salt of 2,4-D at 500 and at 333 p.p.m. killed sweet fern without injuring blueberry plants.

[704] 634.75-1.432
VISSER, W. C. De eisen van aardbeien ten aanzien van de diepte van het grondwater. **[Demands of strawberries on soil ground water.]** *Meded. Direct. Tuinb.* 11, 1948 (351-355). Hort. Abs. 18 (174). [Du.e.]

Graphs show that there is a rapid decrease in yield of strawberries if the groundwater level drops below 1 m.

[705] 634.774-2.954
CRAFTS, A. S.; EMANUELLI, A. **Some experiments with herbicides in pineapples.** *Bot. Gaz.* 110, 1948 (312-318). [Agric. Expt. Sta., Rio Piedras, Puerto Rico]

In tests of 8 commercial oil fractions on pineapple and weeds in the greenhouse, only the light-fraction stove naphtha did not injure pineapples. Heavier oils killed the growing point. Under field conditions even stove naphtha injured mature pineapple plants. A dinitro selective weedkiller injured pineapple leaves but did not kill grasses. A fortified oil-emulsion spray may be used provided the pineapple plants are protected from direct application.

[706] 634.776-1.5
MALAN, E. F. **Grenadilla production.** *Farm. S. Africa* 23, 1948 (625-626).

Sunn hemp or velvet beans, to which 5-10 tons/morgen of kraal manure and 600 lb. of super. have been applied, should be ploughed under before planting grenadillas. Deep, cool loam or sandy loam produce the best crops. Compost or well-rotted kraal manure and 2 lb. of rock phosphate should be mixed with the topsoil in the bottom of the planting holes. A top-dressing of N manure may be necessary during the first year, but an excessive application of N may promote growth at the expense of bearing capacity. An annual application of ½-1 lb. of super. and 15-20 lb. of kraal manure per plant should be applied annually.

634.9 FORESTRY

(*See also* Abs. Nos. 443, 456, 471, 775)

[707] 634.9-1.411.4 : 631.81
THURMANN-MOE, P. Svenske og norske forsøk med gjødsling av skogsmyr. **[Swedish and Norwegian experiments on fertilization of forest bogs.** *Tidsskr. Skogbr.* 54, 1946 (160-172). Biol. Abs. 22 (2245). [N.]

The experiments date from 1870-1880. A considerable increase in growth was obtained by adding 25 cu.m./decare of peat soil rich in nutrients and also by adding 25 cu.m./decare of clayey moraine gravel.

[708] 634.9-1.435.4
DAY, M. W.; NELSON, T. C. **Tree planting on clay soils.** *Mich. Agric. Expt. Coll. Quart. Bull.* 31, 1948 (28-34). [Dunbar For. Expt. Sta.]

The data indicate that reforestation is possible on heavy soils if adequate surface drainage and ridges for the trees to be planted on are provided and there is some reduction of the competition from grasses and other vegetation.

[709] 634.9-1.436
FOWELLS, H. A. **The temperature profile in a forest.** *J. Forestry* 46, 1948 (897-899).

Maximum and minimum air and soil temperatures were recorded in a mixed conifer stand at positions ranging from 120 feet above ground to 18 inches below the mineral surface of the soil. The highest temperatures (maximum and minimum) were always found at the soil surface.

[710] 634.9-1.584 : 633.1
HARTMANN, F. Der Waldgetreidebau als zusätzliche Ernährungsquelle. **[Intercropping with cereals in the forest as a supplementary source of food.]** *Allg. Forst- u. Holzw. Ztg.* 57, 1946 (17-20). For. Abs. 10 (45). [G.]

Intercropping with cereals during the regeneration of forest stands improves soil climate and biological activity, creates a favourable environment for young forest plants and does not adversely affect the nutrient régime of good, fertile forest soils. Suitable sites are clear-felled areas which are not heavily overgrown with grass, *Vaccinium* or heather, have a gradient not too steep for reaping, with fresh soils whose water supply will not be endangered, where soil fertility is such that no fertilizer is necessary, where snow does not lie too long into the spring and where animals constitute no serious threat. Mild humus, especially brown forest soils, are suitable, but dry soils, acid red-brown soils, dry podzol and acid, wet peaty types should be avoided.

[711] 634.9-2.591.24-1.4
GERMETEN, F. Vegetasjons og jordundersøkelser av markberedningsfelter. **[Investigations of the vegetation and soil of screefed areas.]** *Medd. Norske Skogforsøksv.* 9, 1947 (393-458). For. Abs. 10 (44). [N.e.]

The composition of vegetation invading screefed areas under shelterwood in Scots pine forest, the time elapsing between screefing and invasion, the possibility of such vegetation interfering with natural regeneration of pine and spruce and the differences in soil pH, humus content, NO_3 content and NH_4Cl-soluble Ca in screefed and intact areas were studied.

[712] 634.953.6
AFANASIEV, M. **Trees and tree planting for posts, windbreaks and erosion control.** *Okla. Agric. Expt. Sta. Bull.* B-314, 1947, pp. 22. For. Abs. 10 (49).

[713] 634.956.4-1.875
RAYNER, M. C. **Behaviour of Corsican pine stock following different nursery treatments (*Pinus nigra* var. *calabrica* Schneid.)** *Forestry 1947*, 21, 1948 (204-216).

The survival and growth of two-year-old Corsican-pine transplants of different nursery origins on poor exposed heath land were compared. The plants were (1) raised in the same poor heath soil with addition of compost and lined-out for one year in similar soil with the addition of compost, (2) raised by standard nursery methods and lined-out for one year in the same nursery and (3) raised as in (1) and lined-out as in (2). Basic slag at a rate of 2 oz. per tree was applied at planting to one series. Plants of origin (1) were superior to those of origin (2) and those of (3) were intermediate. Application of P benefited growth in all series, but the heavy death rate of group (2) was increased by P. The root systems of plants raised in heath soil were well supplied with short roots and mycorrhizas at planting and throughout growth, whereas those of the nursery transplants were very deficient in short roots and mycorrhizas.

[714] 634.972.3-1.81
ITHIER, H. La fumure du peuplier est-elle rentable? **[Is it profitable to manure poplars?]** *Potasse* 21, 1947 (186-188). [F.]

Experiments were carried out in a nursery with a humus-rich calcareous clay soil subject to flooding in winter. The ground was supplied with basic slag at 600 kg./ha. and KCl at 300 kg./ha. A few days before planting cuttings at a density of 11,000-12,000 per ha., 150 kg. of $CaCN_2$, 120 kg. of $(NH_4)_2SO_4$

or 150 kg. of $Ca(NO_3)_2$ were applied. In the second and third years the nursery was treated with 100-125 kg. of $CaCN_2$. The manuring promoted the formation of large plants and increased the number of those with a circumference of 12-16 cm.; the demand is highest for plants of this size. Fertilizing was profitable. The application of slag alone gave results no better than those of unmanured plots.

On planting out, each tree was supplied with 1 kg. of 7-17-24 fertilizer and the application was repeated the second and third years. Trees of a neighbouring plantation, which was 15 years old, had rough bark, a mean circumference of 50-70 cm. and a height of 15-17 m., while trees of the treated plantation, after 10 years, were perfectly formed and had a smooth white bark, a mean circumference of 75-95 cm. and a height of 18 m. Manuring was considered to be profitable in this instance also.

[715] 634.975-1.466.1

MØLLER, C. M. **Mycorrhizae and nitrogen assimilation.** *Forstl. Forsøgsv. Danm.* 19, 1947 (105-208). For. Abs. 10 (16-17). [E.da.]

Results obtained by the author and other workers are reviewed. It was found that mycorrhizae develop most vigorously on active mors and least so on mulls and very poor mors, and the poorer the site, the less exacting the N requirements of the fungus species concerned. Non-mycorrhizal mountain pines grew well on practically N-free media and in waterlogged cultures. Experiments with mountain pine cultured on N-free media failed to provide evidence of any ability of mycorrhizae to fix free N and no genuine proof has been furnished of a special capacity of mycorrhizae for assimilating organic N compounds. The occurrence of mycorrhiza-producing fungi on roots may be interpreted as a type of epiphytism.

Investigations of soils under a 40-year-old mountain pine, on adjacent heathland under an isolated clump of Norway spruce, and of blown sand indicated that there had been a mobilization of N and humus in the upper 10 cm. of soil. Most of the mobilized N was found in the pine trees and their litter and no increase in N per unit area was ascertainable. The pore volume of the upper 10 cm. of soil was greater, and density and water content lower than those of the adjacent heathland. These differences were smaller than those between the soil under the spruce and the blown sand.

[716] 634.975-1.811.4

NĚMEC, A. Biochemicko-pedologická studia o příčinách krněni smrku a borovice v polesí Smrček stát, lesní správy Slatiňany. **[Biochemical and pedological studies concerning the causes of the stunting of spruce and Scots-pine stands in the forest section Smrček of the State forest administration Slatinany, near Chrudim.]** *Zprávy Stát. Výzkum. Ústavů Lesn. ČSR Ročen.* 1947 (31-54). [Cz.e.r.]

A high degree of soil acidity and a resulting lime deficiency in the trees were considered to be the explanation of the failure of mixed stands to make good growth on degraded schist soils. On sandstone soils the use of ground limestone in quantities corresponding to 50-80 centners/ha. of $CaCO_3$ improved the soil conditions. On some extremely deficient soil profiles the use of PK fertilizers was also necessary in addition to liming, particularly where deciduous trees and the more exacting conifers were concerned.

[717] 634.975-1.811.9

NĚMEC, A. Význam mikroelementů pro vzrůst lesních dřevin. **[The significance of trace elements for the growth of forest plants.]** Repr. *Lesnická Práce* 27, 1948, pp. 14. [Cz.e.] [Res. Inst. For. Biochem. and Pedology, Prague-Dejvice]

The absorption of Mn from the soil by conifers increases very rapidly with increasing soil acidity. The application of a copper slag containing 1.62% of CuO to spruce on a podzol soil with hardpan layers increased the rate of growth of the trees. B at about 0.8 mg./kg. of soil applied simultaneously with lime to spruce in a forest nursery also had a favourable effect, mainly on root growth. It is suggested that the effect of the application of crushed basic eruptive rocks (basalt, diabase, gabbro, amphibolite) on the growth of plants on degraded forest soils is partly due to the presence of micro-nutrients in the rocks.

[718] 634.975-2.112
JACKSON, L. W. R. **"Needle curl" of shortleaf pine seedlings.** *Phytopath.* 38, 1948 (1028-1029).

In pot-culture experiments it was found that needle curl could be induced on one-year-old seedlings of shortleaf pine and slash pine by reducing the soil moisture to the wilting point when the secondary needles were just emerging from the fascicular sheaths ; curled growth is therefore regarded as a drought symptom.

[719] 634.975-2.4 : 576.809.7
KRASILNIKOV, N. A.; RAZNITSINA, E. A. **[A bacterial method of controlling damping-off of Scots-pine seedlings caused by *Fusarium*.]** *Agrobiologia* 1946 (109-121). For. Abs. 10 (120). [R.]

Of 200 strains of bacteria investigated for possible antagonism to a virulent *Fusarium*, 17 were sufficiently active to cause autolysis of the fungal hyphae in 2-5 days. Further experiments were made *in vitro*, in pot and box cultures and in the field, using suspensions of pure-cultured bacteria, 'bacterialized' composts or peat. In laboratory tests only six strains were sufficiently effective, the best belonging to the genera *Pseudomonas* and *Achromobacter*. Treatment with the two best strains lowered the incidence of and mortality from the disease by 70-90% ; in addition, germination and growth of the seedlings were stimulated. Although results strongly suggest that the method may be useful in the control of damping-off, further work is needed in different localities and under different conditions.

[720] 634.989.84 : 581.192
MORK, E. Om strøfallet i våre skoger. **[Litter production in our forests.]** *Tidsskr. Skogbr.* 51, 1943 (73-81). Biol. Abs. 22 (2243). [N.]

Chemical analyses of the litter were made and the annual quantity of the most important plant nutrients added to the soil by the litter was calculated.

635 HORTICULTURE

(*See also* Abs. Nos. 503, 588)

[721] 635-1.811.9
BRASHER, E. P. **The effect of minor elements and widely varying fertility levels on the yields of nine vegetable crops.** *Proc. Amer. Soc. Hort. Sci.* 51, 1948 (346-348). [Delaware Agric. Expt. Sta., Newark]

The experiment was conducted on one soil type during one season. B gave the great increase of 3.3 tons/acre of tomatoes and several crops responded to one or more minor elements. Almost all the crops gave yield increases with a 4-8-12 mixture as compared with no fertilizer.

[722] 635-2.4-2.953
MCKEEN, C. D. **Soil treatment with Arasan for the control of damping-off of certain vegetables.** Abs. in *Phytopath.* 39, 1949 (15).

Soil treatment with Arasan was very effective against damping-off caused by *Pythium ultimum* and *Rhizoctonia solani* in peppers, tomatoes, spinach and cucumber under temperature and moisture conditions favourable to the disease. The greatest protection was obtained from a combined soil and seed treatment.

[723] 635.25-1.67
MCGILLIVRAY, J. H. **Effect of irrigation on the yield of onion seed.** *Proc. Amer. Soc. Hort. Sci.* 51, 1948 (423-427). [Univ. Calif., Davis]

Three types of treatment compared were : dry (no irrigation, but some winter rain), wet (excess irrigation), and medium. Irrigation of onion-seed bulbs gave increased yields of seed; an application of 10 inches of water appeared desirable in this area. The medium treatment gave the highest percentage germination, otherwise irrigation did not materially affect percentages of germination or size of seed.

[724] 635.25-1.83/4 : 581.192
KUNKEL, R. **The effect of various levels of nitrogen and potash on the yield and keeping quality of onions.** *Proc. Amer. Soc. Hort. Sci.* 50, 1947 (361-367). [Colorado A. & M. Coll., Ft. Collins]

In experiments with onions grown on muck, K had no effect on the yield ; N increased the yield, but when applied as a side dressing without K it tended to decrease the keeping quality.

[725] 635.34-1.67

NETTLES, V. F. **Two years results of the effect of several irrigation treatments on the yield of cabbage and snap beans.** *Proc. Amer. Soc. Hort. Sci.* 51, 1948 (463-467). [Univ. Fla., Gainesville]

In a year of low rainfall, cabbage yields were increased by irrigation. The highest average yield of the season was from the plots irrigated by the split-application method, applications of water being made at intervals of about 3 days. Side dressings of additional N in the form of $NaNO_3$ increased yields in seasons of nearly normal precipitation, but in a season of lower rainfall no significant differences in yield resulted from different fertilizer treatments. Snap-bean yields were increased by irrigation in normal and dry seasons.

[726] 635.41-1.81 : 577.16

CHAO-YU, C. **Effect of fertilizing materials on the ascorbic acid content of vegetables.** *Nutr. Bull.* 5, 1946 (23-35). B.A. BIII, 1948 (354).

Fertilizers had no effect on the ascorbic-acid content of spinach and *Beta vulgaris* var. *cicla*.

[727] 635.64 : 577.17

RANDHAWA, G. S.; THOMPSON, H. C. **Growth and fruiting of tomato plants as influenced by growth-regulating substances applied to the soil.** *Science* 108, 1948 (718-719). [Cornell Univ.]

In pot experiments with tomato seedlings 3 applications at weekly intervals of 100 c.c. of 50 p.p.m. *o*-chlorophenoxyacetic acid resulted in weak, yellowish-green plants with poor top growth. Alpha-*o*-chlorophenoxypropionic acid and 2,5-dichlorobenzoic acid did not affect the general appearance of the plants, but the data tended to indicate that root growth was stimulated by the former compound and that larger fruits resulted from the application of the latter. Total yields were not affected. Fruits harvested from treatments with α-*o*-chlorophenoxypropionic acid and 2,5-dichlorobenzoic acid were sweeter and richer in flavour than those treated with *o*-chlorophenoxyacetic acid and the control. The later-maturing, treated fruits were seedless.

[728] 635.64-2.191-1.811.2

GOLDSCHMIDT, W. B. **"Blue-disease" of tomatoes.** *Farm. S. Africa* 23, 1948 (333-336, 344). [Div. Chem. Services]

Affected plants were found on heavy alluvium containing adequate amounts of organic matter, N, K, Ca and Mg. The soil was neutral and contained 0.084% of P_2O_5, 0.0005% of available P_2O_5 and 28.5% of $Fe_2O_3 + Al_2O_3$; the latter suggested a high P-fixing capacity, despite the neutral reaction of the soil. The effect on availability of P of frequent irrigation at 2-, 4-, 8- and 16-day intervals was studied. 15.1% super. was applied at 1500 lb./morgen at 3-4-inch depth, and kraal manure at 20 tons/morgen. Plants receiving super. at planting time were quite healthy, but those receiving super. later as 2 top dressings developed the disease markedly: the highest yields of tomatoes were from plots irrigated at 8-day intervals.

[729] 635.65-1.543

LARSON, R. E.; PENG-FI, L. **The influence of various row and plant spacings on yields of lima beans.** *Proc. Amer. Soc. Hort. Sci.* 51, 1948 (479-485). [Penn. St. Coll.]

An inverse relationship was found between spacings within the rows and total yields per acre. Plant spacings with approximately equal dimensions generally gave better yield than spacings with equal area but unequal dimensions, but the use of equal-dimension spacing probably awaits developments in weed control and harvesting. Of all treatments studied a spacing of 30 × 2 inches was generally most productive for either variety under the soil and climatic conditions of the experiment.

[730] 635.65-1.67 : 581.192

JANES, B. E. **The effect of varying amounts of irrigation on the composition of two varieties of snap beans.** *Proc. Amer. Soc. Hort. Sci.* 51, 1948 (457-462). [Univ. Fla. Agric. Expt. Sta., Gainesville]

Increasing soil moisture by irrigation increased the size of the pods considerably. The greatest effect of irrigation was that on hydration. On a fresh-weight basis there was considerable variation in most of the constituents from the different treatments, but on a dry-weight basis these differences either disappeared or became much smaller.

[731] 635.65-2.8
WANT, J. P. H. VAN DER Het stippelstreep van de Boon (*Phaseolus vulgaris*), een ziekte veroorzaakt door een virus, dat in de grond overblijft. **[Stipple streak of the bean (*Phaseolus vulgaris*), a disease caused by a soil-borne virus.]** *Tijdschr. PlZiekt.* 54, 1948 (85-90). R.A.M. 28 (44). [Du.e.]

The virus lives in the soil which may be sterilized by steaming for 30 minutes at 100°C. Natural infection may develop in young plants within a week after sowing in contaminated soil, but symptoms of the disease do not appear until much later. Plants germinated in steam-sterilized soil may contract the disease on planting out in contaminated soil.

[732] 635.656 : 631.427.3
TREMBLAY, F. T.; BAUR, K. E. **Plant analysis : a method of determining the potassium requirements of peas.** Abs. in *Proc. Soil Sci. Soc. Amer. 1947*, 12, 1948 (157). [St. Coll. Wash., Pyuallup.]

On 2 soil series varying considerably in potassium-supplying power, the K content of peas receiving different fertilizer-ratio treatments showed no correlation with the exchangeable-K content of the soils. Additions of normal amounts of N and P in the fertilizers had no significant effect on the K uptake of the pea plants. The leaf-blades or petioles of the third node from the top when the plant had reached an 8 or 9-node stage seemed most indicative of its K status. Tentative limits have been set of the estimated percentage of K required in the leaves from pre-bloom to full-bloom stage in order to delineate deficient-, low-, sufficient- and high-K areas.

[733] 635.937.34-1.811.1
SEELEY, J. G.; POST, K. **Soil nitrate levels for roses.** *Proc. Amer. Soc. Hort. Sci.* 51, 1948 (613-617). [Cornell Univ., Ithaca, N.Y.]

Maximum rose production was obtained with 25-100 p.p.m. of nitrate in the soil. Less fertilizer was required to maintain optimum N levels during winter and less was necessary during the first season than in subsequent seasons. Symptoms caused by excess soil N are described.

GEOGRAPHICAL

(4) EUROPE

(*See also* Abs. Nos. 496, 519, 619, 669)

[734] (4/9)63
DE TURK, E. E.; TOLLEY, H. R.; SALTER, R. M. **Freedom from want. A survey of the possibilities of meeting the world's food needs.** *Chron. Bot.* 11, 1948 (211-283).

By better use of present-cultivated lands and by bringing certain new lands into use, food production could be doubled by 1960. By taking into account yield increases readily attainable in different soil regions of U.S.A., yield increases in China, India and the Soviet Union have been predicted. Agriculture can be expanded in 52% of the world's land area. Chernozem and chestnut soils are now largely under cultivation. Some alluvial soils in the tropics can be reclaimed by drainage or irrigation. Great expansion of food production should be possible in the podzols of the north-temperate zone and in the red soils of the tropics and subtropics, although much of these are unsuitable for agriculture because of unfavourable topography and stoniness.

The adequacy of world supplies of fertilizer necessary for this intensified production of old land and development of new areas is discussed.

[735] (42)631.44
MUIR, A. **Soil survey and soil classification.** *Chem. Indust.* 51, Dec. 18, 1948 (810).

Systematic surveys and mapping into soil series are being carried out in Lancashire, Somerset, North Devon and Yorkshire. Hydromorphic soils occupy large areas in Britain and are of considerable importance in agriculture and forestry.

[736] (43)633.491-1.5
AGRICULTURAL ENGINEERING RECORD. **Potato growing in Germany.** *Agric. Engng. Rec.* 2, 1948 (184-186).

Potatoes are grown in Germany on fairly small farms with no mechanized cultivators. Depth of planting has been reduced from 8 to 4 inches and the one-row implement has been supplanted by a multi-row toolbar on which can be fixed dibbling wheels, ridging bodies or hoe tines. The toolbar is drawn by tractor or horse. Potatoes are planted by

hand. Weeds are destroyed by shallow hoeing. Before harvest, the haulm is either mown or destroyed by a 3-row power-driven machine and the potatoes are lifted by spinner or elevator and shaker diggers.

[737] (437)631.4
GÖSSL, V. Celkový ráz půd na krystaliníku v oblasti Ceskomoravské vysočiny. [**The general character of soils on the crystaline rocks in the region of the Czech-Moravian plateau.**] *Sborn. Výzkum. Ústavů Zeměd.* 173, No. 20, 1948 (37-76). [Cz.]

[738] (437)631.4
KYNTERA, F. K charaktéristice půd stredočeského žulového masivu. [**Characteristics of soils of the granite massif of central Bohemia.**] *Sborn. Výzkum. Ústavů Zeměd.* 173, No. 20, 1948 (77-116). [Cz.]

[739] (437)631.4
NAJMR, S. Hlavní poznatky z půdoznaleckého prozkumu Průhonicka. [**Study of the soils in the neighbourhood of Průhonice.**] *Sborn. Výzkum. Ústavů Zeměd.* 173, No. 20, 1948 (155-186). [Cz.]

[740] (437)631.4
STRÁDAL, V. Povaha půd na plistocenních uloženinách v okrese Hořovice. [**The character of soils on the pleistocene deposits in the district of Hořovice.**] *Sborn. Výzkum. Ústavů Zeměd.* 173, No. 20, 1948 (141-153). [Cz.]

[741] (437)631.445.2
JANOVSKÝ, J. Podzolové půdy v západočeské oblasti. [**Podzol soils in the Western Czech region.**] *Sborn. Výzkum. Ústavů Zeměd.* 173, No. 20, 1948 (119-137). [Cz.]

[742] (437)631.445.9
GÖSSL, V.; KÁŠ, V.; NAJMR, S. ET AL. Agronomicko-pedologická studie o českých křídových slinovatkách (o půdách humuso-karbonátových neboli rendzinách). [**A study of Czech chalk rendzinas from the point of view of agriculture and soil science.**] *Sborn. Výzkum. Ústavů Zeměd.* 174, No. 21, 1947, pp. 182. [Cz.r.]

The rendzina soils of this type are classified agriculturally as wheat soils, i.e., soils that are suitable for growing wheat and lucerne and other leguminous crops. The productivity of rendzinas is less than that of chernozems, yields on rendzina soils being only 52-59% of those on chernozems and often being as low as 30%.

[743] (437)631.46
KÁŠ, V. Mikrobiologická charakteristika půdních typů na algonkiu z pražského okolí. [**Microbiological characteristics of soil types on Algonkian parent rocks in the neighbourhood of Prague.**] *Sborn. Výzkum. Ústavů Zeměd.* 173, No. 20, 1948 (189-194). [Cz.]

[744] (438)631.445.9
MUSIEROWICZ, A. Rędziny kredowe północnej krawedzi Podola. [**Chalk rendzinas at the northern border of Podolia.**] *Rocz. Nauk Roln.* 50, 1948 (80-98). [Pl.] [Cent. Coll. Agric., Warsaw]

[745] (44)634.9-1.4
ROL, R.; POURTET, J.; DUCHAUFOUR, P. ET AL. Notes forestières sur la Bretagne et le Cotentin. [**Forestry notes on Brittany and the Cotentin.**] *Ann. Éc. Eaux For. Nancy* 10, 1947 (263-303). For. Abs. 10 (13). [F.]

Topography, climate, soils, existing forest types, common tree species and the 'landes' are described. It is concluded that existing degraded hardwood forests should be improved before afforestation of the 'landes'.

[746] (45)631.4
PETROSINI, G. La pianura del Sele. [**The plain of the Sele.**] *Ann. Fac. Agrar. Portici* 16, 1947-1948 (5-75). [I.]

The region described is a triangle of area about 40,000 ha. south of Salerno and bordering the gulf of Salerno; it is roughly bisected by the river Sele. The land is of fair quality, the standard of agriculture being highest near Salerno and progressively falling off southwards. Mechanical and chemical analyses of 82 soils are given for two depths (0-25, 25-50 cm.). The soils are mostly rich in $CaCO_3$, many being gravelly. They are predominantly derived from attrition of water-borne limestone (often travertine) and are regarded as more or less ancient calcareous alluvium. They are nearly neutral, all are rich in K, but poor in P. The fine earth is of remarkably uniform mechanical composition at both depths throughout the region, fine sand predominating in nearly every sample. The lower standard of agriculture south of the Sele is ascribed to subsoil features. The husbandry of the whole region is based mainly on horticulture, cereals and livestock, pasture being negligible in the south. South of the Sele tomatoes grown without support and melons and tobacco are important.—R.N.

[747] (458.1)631.4
MORANI, V. I terreni della Sicilia. **[The soils of Sicily.]** *G. Sci. Nat. Econ. Palermo* 45, 1948, pp. 19. [I.]

A folding coloured map shows provisionally the distribution of the 9 geological soil types recognized on the basis of examination of 394 samples taken from 77 communes. The types are described in general terms, sometimes with the addition of approximate figures for area, pH, content of principal nutrients, etc., but no tabular or profile data are given. The soils are broadly of two kinds —ancient and recent lavas and basalts with some schists in the east, and elsewhere various calcareous or gypseous clays and sands with some "terra rossa". Land use is briefly indicated.—R.N.

[748] (47)631.445.5: 631.58
POCHVOVEDENIE. **[The great plan for the conquest of drought.]** *Pochvovedenie* 1948 (705-706). [R.]

The Soviet of Ministers of the U.S.S.R. and the Communist Party have made a plan which, if executed, will, it is hoped, eliminate the menace of drought and soil erosion from the large steppe and forest-steppe regions of the U.S.S.R. The plan is based on the adoption of the Dokuchaev-Kostychev-Williams complex of agriculture—i.e., a system of alternate husbandry supported by an immense belt of protective forest across the steppes and countless windbreaks and artificial ponds on collective farms. It is said that such a plan could only be carried out under a socialist economy.

[749] (485)631.411.4
HJERTSTEDT, H. De organogena odlingsjordarnas beskaffenhet i olika län med avseende på torvslag, förmultningsgrad och reaktion samt innehåll av kalk och kväve, kali och fosforsyra, organisk substans, seskvioxider och svavelsyra. **[The properties of organogenic cultivated soils in different districts with reference to type of peat, degree of decomposition and reaction, and content of lime, nitrogen, potash, phosphoric acid, organic matter, sesquioxides and sulphuric acid.]** *Svenska Vall- o. MosskFören. Kvartalsskr.* 10, 1948 (131-152). [Sw.]

An attempt is made to classify Swedish organic soils according to their chemical composition. A map shows where harmful amounts of sulphuric acid have been found in peat soils.

[750] (492)631.47
LIERE, W. J. VAN De bodemkartering van Nederland. II. De bodemgesteldheid van het Westland. **[Soil survey of the Netherlands. II. Soil conditions in the Westland.]** *Versl. Landbouwk. Onderzoek.* 54, No. 6, 1948, pp. 152 + 10 maps. [Du.e.]

The aims of the survey were to establish and classify Westland soil differences, to map the distribution of the different units and to relate the soil differences to crop response. Maps were drawn to scales of 1:25,000 and 1:50,000. In general, American methods were used, the main differences lying in the greater detail of the investigation, the criteria used for mapping and nomenclature. A definite system of nomenclature was not used, but the soil series were named according to their important features and could sometimes be related to a region, e.g., Westland *broek* soils—moist, compact clays—and Betuwse *kom* (basin) soils. Each soil series was symbolized by a capital letter, referring to landscape, followed by a small letter. Thus *Eg* denoted the *gors* soils—clay soils laid down under tidal influence—, *EDo*, clay on dune sand and *Dg*, grassland soils on dune sand, the first series occurring in the estuaries and the last in the dune regions. Other landscapes comprised *I*, inversion land—low-lying peaty polders—and *P*, *droogmakerij*—drained land and reclaimed lake bottoms. The system was sometimes modified by replacing the symbol letters by numbers ; thus 0-9 denoted clays of various types, 11-19 clay on coarse sand, 21-29 *geest* soils—moist dune sand containing some clay—,31-39 sandy soils and 41-49 peat soils. Soil type was indicated by a number added to the soil-series symbol and referring to the water conditions of the profile, 1 representing a freely drained soil and 9 a very poorly drained soil or horizon.

The detail soil map was correlated with the growth and yield of various crops, and possibilities of soil improvement in Westland market gardens were discussed.

[751] (493)631.4
VANDERHASSELT, P.; SCHEYS, G. Het ontstaan en de landbouwkundige waarde van de bodemtypen in Zuid-Limburg. **[The development and agricultural value of the soils of South Limburg.]** *Agricultura* 45, 1947 (257-263). [Du.]

The loess soils of this region, probably

originally of homogeneous profile, have undergone 2 transformations, a geological one with light flooding of the land and superficial erosion and a pedological one involving vertical eluviation of lime and colloidal particles from the subsoil. These transformations have made the profile heterogeneous and make it possible to plan orchard development in the district.

(5) ASIA

(*See also* Abs. Nos. 463, 512, 647)

[752] (54)631.452 : 312
MUKHERJEE, J. N. **The productivity of Indian soils in relation to food supply.** *Roy. Soc. Emp. Sci. Conf. Rept. 1946*, 2, 1948 (284-298).

The total production of major food grains (rice, wheat, jowar, maize and gram) in India from 1920-21 to 1940-41 and the yields per acre are given and compared with the yields per acre in some other countries. The production of food grains has shown only a negligible increase while the population has increased by nearly 90 million. The main limiting factor in crop production in India is water; the area under irrigation is given for 1910-11 to 1935-36. Other matters discussed are manures and fertilizers, crop rotation, drainage, conservation of moisture and cultivation.

[753] (54)631.459 : 631.613
DAVIS, P. W. **Contour bunding and trenching as counter erosion measures on the Nilgiris.** *Indian Forester* 73, 1947 (537-538). For. Abs. 10 (166).

The inadequacy of experimental contour drains, laid out in 1941 by the Soil Erosion subcommittee of the Nilgiris District Periodical Council, was due to (1) the fact that strict contour levelling of the drains was not possible in the first place, and (2) neglect of subsequent maintenance, whereby deposited silt was allowed to accumulate in the drains.

[754] (54)631.47
MUKHERJEE, J. N. **The position of soil survey and land classification in India.** *Roy. Soc. Emp. Sci. Conf. Rept. 1946*, 2, 1948 (277-283).

A review of soil studies in India. Much useful information is available in early land-settlement records. A short account is given of modern soil studies based on profile examination and the differentiation of various soil zones and of surveys made in connexion with irrigation projects.

[755] (54)631.621
ASGHAR, A. G.; DHAWAN, C. L. **The quality of the drain, river and canal waters of the Punjab.** *Indian J. Agric. Sci.* 17, 1947 (377-388). [Irrigation Res. Inst., Lahore]

The pH of the drain water is 7.25-8.75. The drains remove several thousand tons of salts per year from the soil, but when taken into consideration with the total quantity of salts present in the catchment areas of the drains, the amount is very small.

[756] (548.7)631.4
CEYLON DEPARTMENT OF AGRICULTURE. **Soil reconnaissance surveys.** *Ceylon Dept. Agric. Rept. 1946*, Pt. IV. D, 1948 (13).

A study of the physical and chemical characteristics of the major soil types has shown that Ceylon soils are not dissimilar to the laterite and red soils of India in respect of specific gravity, pore space, water-holding capacity, ignition loss, sticky-point moisture and volume expansion. A high positive correlation exists between the clay content, water-holding capacity, sticky-point moisture, moisture equivalent and loss of ignition of the soils. The rate of percolation and friability are determined by the nature and amount of clay. The pH of the soils is related to the silica/sesquioxide ratios of their clays. The degree of dispersion of the soils and hence of their erodibility is governed mainly by the nature of the clay, the non-lateritic soils showing the highest and the lateritic soils the lowest dispersion ratios. The base-exchange capacity is determined by the amount and nature of both the clay and the organic matter. There is, in general, a parallelism between the pH values and the silica/sesquioxide ratios of the soils and their degree of saturation with respect to bases.

The soils of the dry zone of Ceylon are lateritic or non-lateritic. They generally have high exchangeable-base capacities when of high or medium clay content, low ultimate pH values and frequently high base-saturation percentages. They are neutral or moderately acid and fairly rich in available mineral nutrients. Their dispersion ratios are relatively high and they tend to be easily erodible. Some of them are not friable when dry and are sticky and difficultly permeable when wet.

The soils of the wet zone are invariably lateritic or of laterite type. They have generally lower exchangeable-base capacities and are of lower mineral-nutrient status than the soils of the dry zone. They are less saturated with bases and more acid. Being more permeable to and less dispersible in water, they drain better and are not so erodible as the dry soils and are more amenable to cultivation under varying moisture conditions.

[757] (569)634.957
PHILIPPIS, A. DE **[Notes and comments on afforestation in Palestine.]** *Forest, Jerusalem* No. 1, 1947 (1-4). For. Abs. 10 (190). [Hbr.]

The principal obstacles to afforestation in Palestine are the advanced state of degradation of the soil and natural vegetation, and the eastern-Mediterranean climate, which is unfavourable to forest growth. Only in the Mediterranean zone of the country are natural woodlands to be found, and methods of improving these woodlands are recommended.

Afforestation can be carried out only in the Mediterranean zone. Excepting the coastal plain and the Emek, the whole of this zone is mountainous and rocky, and the soil often very shallow and predominantly of a *terra-rossa* type. The clay and lime content of the soil is very variable, and this must be taken into account in choice of species. The extreme degradation of the soil will often lead to poor results at first and more than one rotation may well be necessary to restore its fertility. Terracing is advisable on slopes. Direct sowing of *Pinus halepensis* has so far failed, but ball planting gives survival of 60-70% and sometimes even 80-90%. Planting must be done immediately after the first autumn rains; spacing may be as wide as 2 × 2 m. on good soils, but a closer spacing of 1.0 × 1.0 m. is advisable on poor or rocky soils so as to obtain closed canopy by the end of 3 years when cultivation ceases. Closer spacing also reduces branching and, consequently, pruning.

P. pinea can be established by direct sowing and will grow on clay soils unsuitable for *P. halepensis*. It has, however, a slower rate of growth and cannot endure calcareous soils. Eucalypts have been much planted, but often with rather disappointing results, a rapid initial growth rate being succeeded by a period of check. Where rainfall is less than 500-600 mm. irrigation is necessary.

(6) AFRICA

(*See also* Abs. Nos. 390, 667, 668)

[758] (65)631.415.3 : 631.47
GAUCHER, G. Méthodes actuelles d'étude des terrains salés en Afrique du Nord. **[Current methods of studying saline lands in North Africa.]** *C.R. Conf. Pédol. Méditerr. 1947*, 1948 (455-473). [F.]

Studies are made of the origin of soil salinity, the geology, hydrology, vegetation, pedology and agrology of saline lands, and the chemistry and mineralogy of the salinizing agent. These studies should enable maps to be produced of soil salinity (surface and subsoil), vegetation, salinizing factors and agricultural use, especially as detailed geological maps of Algeria are already available. Soil analysis is regarded as a tool of secondary value to be used for verifying field observations.

[759] (65)634.975-1.4
FAUREL, L. Note sur les cédraies de l'Atlas de Blida (Algérie), ses sols et ses associations végétales. **[Note on the cedar forests of the Atlas of Blida (Algeria), their soils and plant associations.]** *C.R. Conf. Pédol. Méditerr. 1947*, 1948 (474-478). [F.]

The soils are mainly derived from schists and have a surface pH of 6.2-7.2. Beneath the litter horizon in a typical soil there is a dark brown humus horizon, powdery when facing south, tending to be granular when facing north, beneath which is a yellowish, slightly humous horizon overlying the mother rock.

[760] (661)631.67
VIGUIER, P. Situation des terres irriguées de l'Office du Niger. **[Irrigated lands of the Niger Office.]** *Rev. Int. Bot. Appl.* 1947 (460-470). Agron. Trop. 3 (548). [F.]

The fact that the yields of rice and cotton obtained by native cultivators have been lower than those obtained by the Office du Niger is attributed mostly to defective irrigation. Improvements envisaged include the formation of a network of water channels, the introduction of mechanical cultivation methods, weed control, especially in the rice-growing areas, provision of settlers with agricultural equipment and the improvement of irrigation technique.

[761] (663)631.459 : 551.51

AUBERT, G.; DUBOIS, J.; MAIGNIEN, R. L'érosion éolienne dans le nord-ouest du Sénégal. **[Wind erosion in the north-west of Senegal.]** *C.R. Conf. Pédol. Méditerr. 1947*, 1948 (443-450). [F.]

The soils are tropical ferruginous soils, very low in humus and composed mainly of coarse and fine sand. The coarse sand appears to be the residue of a former surface horizon. The soils lose their structure rapidly when cultivated and become subject to wind erosion. The colour of the surface soils indicates the degree of wind erosion—the least eroded are grey, more eroded are white and most eroded are red. Wind erosion has been the main cause of a decline in groundnut yield. Measures of control should include bush fallows, windbreaks and increasing of the organic-matter contents of the soils.

[762] (675)551.577

REGNIER, M. E. La régime pluviométrique dans la province de Costermansville. **[The rainfall regime in the Costermansville province.]** *Bull. Agric. Congo Belge* 39, 1948 (875-892). [F.]

The length of rainy and dry seasons, rainfall frequency and rainfall variation are discussed. Tables show average annual rainfall and number of rainy days for 83 stations.

[763] (675)633.74-1.4

CROEGAERT, J. Note sur quelques sols à cacaoyers au Congo Belge. **[Some cacao soils in the Belgian Congo.]** *C.R. Sem. Agric. Yangambi* 1947 (582-588). Hort. Abs. 18 (224).

Climatic and soil requirements of cacao are discussed. Small patches of soil suitable for growing cacao exist in parts of the central Congo basin.

[764] (675)633.74-1.5

THIRION, F. Le cacaoyer, quelques modes de culture expérimentés à Yangambi. **[Some methods of growing cacao tried at Yangambi.]** *C.R. Sem. Agric. Yangambi* 1947 (427-431). Hort. Abs. 18 (224). [F.]

The simplest method is sowing under controlled forest cover from which species harmful to cacao, e.g., *Piptadenia* spp., have been removed. Burning should be practised only on soils rich enough to support food crops between the cacao. At Yangambi, cacao planted at a density of 1300-1500/ha. gives a closed cover from the fourth year.

[765] (678.1)631.4

ZANZIBAR DEPARTMENT OF AGRICULTURE. **Soil investigation.** *Zanzibar Dept. Agric. Rept. 1947*, 1948 (40-42).

The 3 main soil types of Zanzibar occur (1) on limestones, weathering without check to drainage, (2) on non-calcareous sediments, draining according to texture and topography, and (3) on marly or clayey parent material weathering sluggishly at all topographic levels. Their nearest equivalents are terra rossa, red earth and rendzina, respectively, and the names suggested for them are (1) Kinongo, (2) Changa, (3) Namo. (1) range from deep red loams to vestigial humic soils and are the most fertile soils on the island. (2) range from deep reddish through orange-brown loams to grey sluggishly draining sands. (3) include true humus-carbonate soils (rendzina), heavy brown soils and grey clays. Cloves are planted on (1) and (2), but do better on (1). The shallow Kinongo soils are well suited to citrus and food crops, but the very shallow phases are arid and difficult to use. The Kinongo and Changa soils are superficially somewhat similar, but the Kinongo show increasing fertility and decreasing water-holding capacity with decreasing depth of profile. Namo soils are good for rice.

Pemba soils are different from and more fertile than those of Zanzibar Island. They are (1) truncated, reddish-brown soils on variable sedimentary parent material, with fresh minerals within root range of perennial crops, which are mainly cloves; (2) light coloured, fertile sandy soils, mainly under food crops and apparently owing their fertility to calcareous parent material; (3) a type resembling the shallow Kinongo of Zanzibar, but browner in colour.

A comparison is made of the composition of the cocoa soils of Zanzibar and the cocoa soils of Trinidad.

[766] (678.1)631.85

ZANZIBAR DEPARTMENT OF AGRICULTURE. **Kizimbani Experiment Station.** *Zanzibar Dept. Agric. Rept. 1947*, 1948 (17).

Super. has never caused significant responses in clove or other crop trials on the typical red clove soils at Kizimbani, although these soils are considered to be deficient in available P. Sodaphosphate (previously known as silicophosphate) applied to annual crops in 1947 caused very significant increases

in yield, and it is thought that whereas super. is probably rendered unavailable owing to rapid combinations in the soil with Fe and other elements, sodaphosphate retains its availability.

[767] (68.01)631.459 : 631.61
ROSS, J. C. **Land utilization and soil conservation in the Union of South Africa.** *Roy. Soc. Emp. Sci. Conf. Rept. 1946*, 2, 1948 (299-315). [Div. Soil Conserv. and Ext., Dept. Agric. S. Africa]

A short review of the effects of the "era of exploitation" and an account of the State measures for soil conservation and their practical application to date.

[768] (68.01)631.611
TIDMARSH, C. E. **Conservation problems in the Karoo.** *Farm. S. Africa* 23, 1948 (519-530). [Grootfontein Coll. Agric., Middelburg, C.P.]

Problems of Karoo encroachment on the adjoining grassveld areas are discussed.

[769] (689.1)633.854.56-1.5
WEBSTER, C. C. **Report on the preliminary reconnaissance of the possibility of cultivation of tung oil trees in the eastern districts of Southern Rhodesia.** *Rhod. Agric. J.* 45, 1948 (319-329). [Tung Expt. Sta., Nyasaland]

Aleurites montana requires an acid soil with good drainage and fair fertility to a depth of 2-3 feet. Intercropping with tobacco, soybeans or food crops is commonly practised in Nyasaland for the first 4-5 years. Thorough cultivation from the second to the fifth year is very desirable, but intercropping cannot be continued after the fifth year. Thereafter a perennial grass or leguminous crop may be grown.

(7) NORTH AMERICA

(*See also* Abs. Nos. 464, 508, 627, 639, 656)

[770] (71)631.47
COUTTS, C. C.; HOPKINS, E. S. **Land utilization and conservation in Canada.** *Roy. Soc. Emp. Sci. Conf. Rept. 1946*, 2, 1948 (238-249).

Tables give the total acreages of farmland, pasture crops and summerfallow and the crop acreages for 1871-1941. Forest and other land is classified. The part played by the Prairie Farmers Rehabilitation Act of 1935 in the enactment of soil-conservation and irrigation projects is mentioned, and land reclamation is discussed under irrigation, drainage, dykeland and land clearing. Types of agriculture and zoning possibilities are also discussed.

[771] (714)631.416.4 : 631.414.3
ROBERTSON, W. K.; DELONG, W. A. **The potassium status of Eastern Canadian soils.** *Proc. Soil Sci. Soc. Amer. 1947*, 12, 1948 (163-166). [Purdue Univ., Lafayette, Ind. and Macdonald Coll., Quebec]

A report of an investigation into the relative K-fixing powers of 3 soil series.

[772] (73)631.452 : 551.58
ALBRECHT, W. A. **Nutrition and the climatic pattern of soil development.** *Science* 108, 1948 (599). [Univ. Missouri]

The climatic pattern of the United States emphasizes the fertility of the mid-continent for protein production and nutrition of high order. Less rainfall and insufficient soil development to the west limit production in balanced nutrition. More rainfall and excessive development of the soil to the east present greater nutritional problems because of the production mainly of carbohydrates in bulk.

[773] (73)631.812
SAUCHELLI, V. **Some fertilizer problems from the industry point of view.** *Amer. Fert.* 109, No. 9, 1948 (7-9, 28).

Problems involved in the manufacture and supply of fertilizers include those concerned with sampling, especially of granular fertilizers and anhydrous NH_3, mixing, suitable grade, drillability and minor elements.

[774] (76)631.4 : 551.311.33
WASCHER, H. L.; HUMBERT, R. P.; CADY, J.G. **Loess in the southern Mississippi Valley : identification and distribution of the loess sheets.** *Proc. Soil Sci. Soc. Amer. 1947*, 12, 1948 (389-399). [Illinois Agric. Expt. Sta., Urbana]

[775] (77)634.973.713.6-1.4
MINCKLER, L. S. **Planted black locust on claypan soils of southern Illinois.** *Cent. St. For. Expt. Sta. Notes* No. 46, 1948 pp. 2. For. Abs. 10 (192).

Black locust has failed on highly acid claypan soil in Illinois where a thin layer of strongly leached topsoil overlies almost impervious subsoil of light grey clay. The black locust, which needs a deep, well-aerated and drained soil, is being cleared to make way for pine plantations.

(8) SOUTH AMERICA

[776] (85)633.61-1.5
TROMP, L. A. **Production of sugar in Peru. Cane cultivation and harvesting in the land of the Incas.** *Int. Sug. J.* 51, 1949 (18-21).

Irrigation is essential for sugar-cane and all other plant cultivation along the Peruvian coast. The soil in the valleys is of a very fine structure, rich in mineral matter and, when organic matter is present, very fertile. Manuring with guano is practised. The cane is not irrigated for some 4 months before harvest. Irrigation is by river water distributed into canals at the highest point of the valleys. In the dry months the river water is supplemented by water pumped from wells. Details of the two systems of sinking wells for irrigation in Peru are given.

[777] (86)631.459 : 33
SMITH, T. L. La posesion de la tierra y la erosion del suelo in Colombia. **[Land ownership and erosion in Colombia.]** *Agric. Trop. Bogotá* 4, No. 12, 1948 (29-35). [Sp.] [Vanderbilt Univ., Nashville, Tenn.]

The tendency since the Spanish conquest has been towards the extension of white pastoral activities on the plains in the cool zone, and of native cultivation on the slopes.

[778] (86)631.459 : 631.61
ASOCIACIÓN DE INGENIEROS AGRÓNOMOS. Los ingenieros agrónomos rehabilitarán la agricultura Colombiana. **[Agricultural engineers will restore Colombian agriculture.]** *Agric. Trop. Bogotá* 4, No. 8, 1948 (8-12). [Sp.]

Of the 30 million ha. of the Andean region, 23% is rocky, 5% is intensely eroded to the point of almost total loss, 25% is likely to become lost to agriculture within twenty years, 22.5% has lost a large part of its native productivity and 24.5% will do so in the near future. The Association of Agricultural Engineers presents to the Minister of Agriculture an outline of a 25-year plan to prevent a national decline. The plan is based on the organization of an active National Soil-Conservation Service, a great expansion of irrigation and of hydroelectric power production, an increase in land colonization and in the selective immigration of farmers and farm workers, the reduction of paid idleness and a great increase in experimental and extension work.

[779] (86)631.459 : 631.61
PEDRAZA, R. La fertilidad del suelo agricola, su defensa, restauración y conservación. **[The restoration and conservation of soil fertility.]** *Agric. Trop. Bogotá* 4, No. 7 1948 (49-52). [Sp.]

Figures are presented of the annual loss of plant nutrients due to erosion, leaching and crop and stock removal from the agricultural land of the U.S. and the opinion is expressed that the loss due to erosion in Colombia may be relatively yet greater. The importance of collecting and analysing rainfall and run-off data in order rapidly to provide design data for soil- and water-conservation structures is stressed with particular reference to Suarez's work in this field in Colombia.

(9) OCEANIA

(See also Abs. Nos. 445, 505, 628, 629)

[780] (931)631.459
GRANGE, L. I.; GIBBS, H. S. **Soil erosion in New Zealand. Part I. Southern half of North Island.** *N.Z. Dept. Sci. Indust. Res. Soil Bur. Bull.* 1 (n.s.) 1946, pp. 28.

A classification of soil erosion is set out with maps showing both actual and potential erosion. Soils of division I are suitable for safe and permanent use as pasture land. On soils of division II conservation practices are necessary. Division III contains much land that is potentially erodible.

[781] (931)631.459 : 631.61
CAMPBELL, D. A. **Soil erosion and conservation problems in New Zealand.** *Roy. Soc. Emp. Sci. Conf. Rept. 1946*, 2, 1948 (226-229).

Adequately protective pastures for hill country have not been evolved to date in New Zealand. There is insufficient information to decide the maximum gradient that may be cultivated safely, and there are no basic data to define the zone of permanent pastures or the effect of spaced trees in holding slopes too unstable to be held by grass alone.

[782] (931)631.47
GRANGE, L. I.; HAMILTON, W. M.; SMALLFIELD, P. W. **Problems of land utilization and conservation in New Zealand.** *Roy. Soc. Emp. Sci. Conf. Rept. 1946*, 2, 1948 (254-258).

Problems of land utilization are considered in relation to the topography which is the principal factor, and the classes recognized are flat land, rolling hilly land and steep land. The acreages of all three classes are shown separately for the North and South Islands.

[783] (94)633.11-1.5
WATT, R. D. **The problems and possibilities of wheat-growing in Australia.** *Emp. J. Expt. Agric.* 16, 1948 (187-194). [Dept. Agric., Sydney Univ.]

Rainfall is the main governing factor in determining the limits of the wheat belt and the yield per acre in Australia. Wheat is grown on soils varying from free-working sandy soils to fairly stiff clays, but results are best from sandy loams, loams and clay loams. Depth of soil and nature of the subsoil are more important than surface-soil texture as, under Australian conditions, wheat roots may penetrate to 3-4 feet. Few virgin soils of the Australian wheat belt are rich in humus or N, most of them contain satisfactory amounts of lime and K, but all are deficient in available P and there are minor-element deficiencies, especially in Western Australia. Except in Queensland and northern New South Wales super. is applied by a combined seed and fertilizer drill at ½-2 cwt./acre. About a half of Australia's wheat land is affected by wind or water erosion. Districts with too small or too erratic a rainfall and land too steep are being withdrawn from cultivation and rotations are being lengthened to include animal husbandry.

[784] (941)631.4 : 631.67
SMITH, T. L. **Water supply in the agricultural areas of Western Australia.** *Aust. Geogr.* 5, 1947 (115-156). Herb. Abs. 18 (223).

A report is made of an investigation carried out by the Regional Planning Division of the Department of Post-War Reconstruction into a proposal by the Government of Western Australia for a water-supply scheme for that State. The report deals with resources, history of development and social aspects, and contains maps of the major soil zones, land use and types of farming. The coastal plains, which are dominantly podzols, are used primarily for dairying and fruit growing. The scarplands are forested and the inland plateau is the sheep belt which gradually merges through a mixed wheat-and-sheep area into the wheat belt. The scarpland soils are mainly podzols and the plateau soils are mainly red-brown earths and terra rossa.

[785] (941)631.83 : 631.812
CAIRNS, D. **Western Australia's potash lakes.** *Fert. Feed. J.* 34, 1948 (671-674).

The bed of Lake Campion, a nearly dry lake about 170 miles east of Perth, consists of 60% alunite in depths up to 20 feet and an average depth of 7 feet. The area of the lake is 426 acres. The alunite is crushed, roasted to about 850°C. by producer gas, and after cooling the water-soluble potash is dissolved from the calcined alunite by the addition of hot, unsaturated potash liquors and water. The product that crystallizes out contains 60% K_2SO_4. The residue is rich in Al, but contains too much Si to be treated economically.

By using salt obtained by solar evaporation of the brine of L. Campion, K_2SO_4 and KCl for fertilizers and Na_2SO_4 for paper making can be obtained.

[786] (941)633.11-1.582 : 633.326
ELLIOTT, H. G.; SHIER, F. L.; LIGHTFOOT, L. C. ET AL. **Subterranean clover in South West Australia.** *J. Aust. Inst. Agric. Sci.* 14, 1948 (119-124).

Super. should be applied at seeding time at the rate of 1½-3 cwt./acre and an autumn top-dressing of 2 cwt. should be made. Subterranean clover will help to increase wheat production by rendering possible the development of a further 10 million acres of light land and by improving the quality of wheat grown after the incorporation of clover into the soil.

[787] (95)63
ATHERTON, D. O. **Native agriculture in New Guinea.** *J. Aust. Inst. Agric. Sci.* 14, 1948 (107-112). [Dept. Agric., Queensland]

General improvement in education, introduction of staple grains and vegetable proteins and of tools and implements, and wider and more effective use of domestic animals are recommended.

[788] (969)633.61

CLAYTON, J. L. **Sugar cane agriculture in Hawaii.** *Queensland Cane Grow. Bull.* 12, 1948 (59-79).

The greater part of the land is irrigated. The application of water to the fields is still usually by earth ditches and drains, but a new system makes use of pre-cast concrete channels. The Hawaiian system of cane culture is based on a growing period of two years for both plant and ratoon crops. Yields on the best irrigated plantations are nearly 100 tons of cane and over 10 tons of sugar per acre. 2,4-D and allied compounds are much used. In aerial spraying (at the rate of 14 acres in 15 minutes or, under favourable conditions, 100 acres in one hour) the use of oil-soluble 2,4-D is of great benefit since its high solubility allows very low rates of spray per acre to be used successfully.

RECENT BOOKS

631 ROEMER, TH.; SCHEFFER, F.
Grundriss der Ackerbaulehre. [Fundamentals of Agriculture.] Paul Parey, Berlin. 1948. Pp. 226.

631 WORTHEN, E. L.
Farm Soils, their Management and Fertilization. John Wiley & Sons, New York. 4th Edition, 1948. Pp. 510. $3.20

631.4 : 62 KNIGHT, B. H.
Soil Mechanics for Civil Engineers. Arnold and Co., London. 1949. Pp. viii + 256. 21s. od.

631.414.3 KELLEY, W. P.
Cation Exchange in Soils. Rheinhold Publishing Corp., New York. 1948. Pp. xv + 144. $4.50.

631.42 : 631.452 KITCHEN, H. B.
Diagnostic Techniques for Soils and Crops : their Value and Use in Estimating the Fertility Status of Soils and Nutritional Requirements of Crops. American Potash Institute, Washington, D.C. 1948. Pp. xxiii + 308. $2.00.

631.43 BAVER, L. D.
Soil Physics. John Wiley & Sons, Inc., New York. 2nd. Ed., 1948. Pp. xiii + 398, 89 figures. $4.75.

631.459 TALBOT, W. J.
Swartland and Sandveld. Oxford Univ. Press, Cape Town. 1947. Pp. xii + 79. 10s. 6d.

631.459 : 631.61 : 33 BUNCE, A. C.
Economics of Soil Conservation. Iowa State College Press. 3rd printing, 1948. Pp. 227. 18s. od.

631.461 : 576.809.7 WAKSMAN, S. A.
Microbial Antagonisms and Antibiotic Substances. New York, Commonwealth Fund and Oxford University Press. Revised Edition, 1947. Pp. 415. 22s. od.

631.48 KUBIËNA, W. L.
Entwicklungslehre des Bodens. [Soil Formation.] Springer, Vienna. 1948. Pp. 215.

631.61 TWIST, P. T. O.
Land Reclamation. Faber and Faber, London. 1948. Pp. 178 + 15 pl. 15s. od.

631.81
Dictionary of Fertilizer Materials and Terms. Ware Bros., Philadelphia, Pa. Revised edition, 1948. $1.00.

631.81 DYKE, W.
Practical Manuring. Lockwood Press. Revised edition, 1948. Pp. 136. 5s. od.

631.811 HOAGLAND, D. R.
Lectures on the Inorganic Nutrition of Plants. Chronica Botanica Co., Waltham, Mass. Pp. 226. $4.50.

631.85 GRAY, A. N.
Phosphates and Superphosphate. Heron and Co., London. 2nd edition, 1944. Pp. 416. 21s. od.

632.112 TANNEHILL, I. R.
Drought : its Causes and Effects. Oxford University Press. 1947. Pp. 264. 15s. od.

633-1.5 HUTCHESON, T. B.; WOLFE, T. K.; KIPPS, M. S. **The Production of Field Crops.** McGraw-Hill, New York. 3rd edition, 1948. Pp. xv + 430. $4.50.

633.2.03-1.582 STAPLEDON, G.; DAVIES, W.
Ley Farming. Faber and Faber, London. 2nd edition, new and revised, 1948. Pp. 182. 12s. 6d.

634.9-1.4 KITTREDGE, J.
Forest Influences : the Effects of Woody Vegetation on Climate, Water and Soil with Applications to the Conservation of Water and the Control of Floods and Erosion. McGraw-Hill, New York. 1948. Pp. x + 394. 27s. od.

INDEX TO AUTHORS

SOILS AND FERTILIZERS

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SOME ASPECTS OF GREEN MANURING

Green manuring has been practised from early times as a means of supplementing animal manure. The efficacy of the practice is very variable, depending as it does on the soil, the climate and the crop. There must be sufficient moisture present to allow the rapid decomposition of the green manure, and to enable the green-manure crop to grow without depleting the soil of moisture required by the following main crop. A common statement is that green manuring is not effective in regions with a rainfall of less than 20 inches ([15], [18]).

Not only are there divergencies of opinion on the efficacy of green manuring but there is also more than one school of thought on the cause of the increased yields obtained.

A commonly held idea is that the principal benefit results from the increase in the nitrogen and humus content of soils that comes from ploughing in the upper parts of plants in a green and succulent state. Other advantages ascribed to green manuring are improved physical properties of the soil and conservation of soil moisture. In most writings on green manuring attention has been mainly concentrated on the decomposition of the green manure and the resulting effect on the composition of the soil. Experiments and practical experience in South and West Africa have, however, led writers from these countries to hold rather different opinions on the functions of green manures. It has been shown([5]) that green manuring under the light-soil conditions at Ibadan, Nigeria, benefits the crop not by virtue of its improving the nitrogen or organic-matter content of the soil or by modifying soil-moisture relationships, but by the mobilization of mineral nutrients ([5], [6]). In fact, green manure is of no value to the soil so long as it is present in the form of organic matter ; it is only of value when decomposition takes place. A series of experiments has been carried out at Ibadan on the same land for a series of years by growing a green-manure crop in the latter part of the rains for the benefit of a maize crop which is grown in the succeeding season. In these experiments "it made very little difference whether the green manure was cut at the end of the rains and buried green immediately, cut and allowed to decompose gradually before burial or allowed to grow until it died of drought before being dug. It was even found that there was little or no loss in the succeeding maize crop if the green manure was burnt *in situ*. The only thing which seemed to make any substantial difference to the result obtained from green manuring was the complete removal from the field of the whole tops of the crop . . . This was due presumably to the loss of mineral matter." With rotational green manuring and cropping the crops obtained at Ibadan were after ten years as heavy as or even heavier than those obtained from newly cleared bush. This result is ascribed to the efficiency of the green-manure crops in accumulating readily available minerals as well as nitrogen.

Green manuring, at any rate in the tropics, is not now regarded as a means of storing up soil fertility. In Nigeria it behaves as a quick-acting manure the effect of which is fully exhausted in at most two succeeding crops, and is considered to be a practical proposition only when the green-manure crop and another crop can be grown in the same season([5]).

Similar views on green manuring are expressed by South African writers, including Theron([20]) who, dealing mainly with semi-arid agriculture in South Africa, discusses the question of humus in relation to soil fertility. According to him the belief that humus is indispensable to fertility in all soils originated in the distant past when no other fertilizer materials except those of organic origin were available and thus the idea of humus, the organic constituent of soils, was linked with fertility. Further, as organic matter is incorporated in the soil when a

crop is ploughed in, the two ideas are frequently confused. Arising out of this confusion is the belief that green manuring is necessary to the maintenance of humus. Theron's[20] view is firstly that humus is not essential to the fertility of the soil, and secondly that green manuring is unsuitable as a means of arresting loss of humus. The fertility of the soil is as dependent on its physical condition as on the amount of available plant foods that it contains. Cultural operations can bring about a suitable physical condition, but the lack of certain salts will cause this condition to be lost with the first rains. If there is a sufficiency of salts the soil will retain its good tilth. In a humid climate and under irrigation these salts are retained with difficulty, being lost from the soil by leaching, whereas under dry climatic conditions there is little leaching, and the salts and soil structure are retained. In humid conditions green manuring is helpful in that it supplies the necessary salts on decomposition, whereas under arid conditions the soil structure is so stable that green manure is redundant. Thus the factor which determines the necessity or not for green manuring is not the state of depletion of humus, but the physical condition of the soil, and green manuring is only effective on poor soils of unstable physical condition.

A sufficiency of humus is, however, very desirable in any soil, but to produce a significant increase in the humus content by the addition of organic matter would require the addition of hundreds of tons of organic matter per acre at frequent intervals. The amounts usually applied are entirely inadequate for this purpose, and in warmer climates at any rate are so rapidly burnt out that the soil is enriched only in the salts left behind.

McVickar and associates[12], reporting on experiments in Virginia, found that the data indicated that the beneficial effect of leguminous cover crops could not be attributed to an increase in total soil nitrogen, organic matter or water-holding capacity. It is not clear from McVickar's paper whether the crops were turned in or only grown as cover crops. New Jersey experiments[3] also showed that even large quantities of green manure in the form of 2308 lb. of dry soybean hay per acre each year over a period of 28 years had no measurable effect on the organic-matter content of the soil where wheat was followed by soybeans for green manure.

Humus should, therefore, be conserved by an appropriate system of farming which should include the use of perennial crops in the rotation. An unavoidable effect of cultivation is a decrease in the humus content, and the inclusion of a grass crop for a period of years gives the soil the opportunity to recuperate and build up lost humus. and is much sounder than attempts to restore humus by additions of organic matter. "Only sod crops build up the organic matter in soils to a higher level"[1].

According to this view, since green manure supplies salts essential to soil fertility only on decomposition it is actually undesirable for the applied organic matter to accumulate in the soil because the salts are liberated only when decomposition takes place. It is therefore essential that for the maximum effect the green-manure crop should be ploughed under while it is still green and succulent and readily decomposed.

The critical C-N ratio in the absence of leaching is usually taken to be near 35[16]; with narrower ratios some of the nitrogen is available for the crop, whereas with wider ratios crop yields are decreased. Another way of considering the fitness of a green-manure crop for ploughing in is to allow for a minimum of 2 per cent of total N in the green-manure crop; above that, the following crop benefits, while below it the N is absorbed entirely by the micro-organisms effecting decomposition[2].

One advantage of green manuring is said to be an improvement of the physical condition of the soil. That deep-rooted green-manure crops keep the soil open by their root action and thus improve permeability and drainage of the soil is affirmed from observations in Ceylon, tree green manures being particularly effective, though possibly also by bringing up nutrients from the subsoil[7]. Pieters[15] states that leguminous plants, although not necessarily penetrating deeper than cereals, have a larger proportion of the entire root system at greater depths than cereals. McVickar[12], studying the effect of green manures on percolation rate,

found that it was affected by root growth. Winter peas and rye grass induced faster infiltration as time progressed than crimson clover whose root system only penetrated the upper few inches of the soil, whereas pea roots penetrated several inches deep and rye-grass roots 8 inches deep.

The effect of green manures on soil structure varies with the climate and the soil. Martin(13), in experiments in Uganda, found no increase in the number of water-stable crumbs when green manures were turned in. In fact organic manures as a whole had given disappointing results in Uganda as regards structure formation. It is considered probable that under tropical conditions the added organic matter is "oxidized or otherwise disposed of before it can be decomposed to colloidal dimensions."

Browning and Milam(4) found that organic materials that decomposed rapidly, increased aggregation within a few days after they were incorporated into the soil, the effect reaching a maximum within 20-30 days and then gradually declining. Materials that were slower in decomposing required longer time to exert the maximum effect, but continued to be effective over a longer period.

Materials that are resistant to decomposition will have little, if any, effect upon the size distribution of soil aggregates, but will be effective over a longer period in mechanically loosening the soil. In sandy soils where the amount of silt and clay in proportion to the sand is often too small to produce other than a single-grain structure the application of organic material will have little effect on aggregation of the soil(4).

Haylett(6) found that ploughing under crop residues followed by maize in rotation resulted in a substantial increase in maize yields, but the increased productive capacity was short-lived. It appeared to indicate that the benefit was associated with the decomposition process. He suggested that the residues may provide a suitable energy substrate for enhancing the activities of soil micro-organisms that in turn affect the nutrient balance of the soil. The residue crops will have collected available nutrients during growth and released them during the period of decomposition. It appears from the available evidence that the mobilization of nutrients is the chief way in which organic residues function in raising the fertility of the soil. In this particular case the phosphate ion was probably the main one concerned, as the soil on which the experiments were conducted was deficient in available P, and probably it was the mobilization of this element which caused the increased yield as a small annual addition of a phosphate fertilizer produced a marked increase in maize yield.

Pieters(15) considers that the large quantities of CO_2 produced when green manures are turned under act powerfully on soil minerals, and that the effect of green manuring on the availability of phosphate is to be attributed to this by-product of micro-organic activity. One of the indirect benefits of green manuring may, therefore, be to increase the availability of soil minerals.

Prianishnikov(17) has shown that certain common green-manure crops (lupins, buckwheat and mustard) are capable of extracting much more phosphate from the soil minerals than can other plants. When these crops are used as green manures, therefore, the effect would be to take "unavailable" phosphate out of the soil and after passage through the green manure to return it to the soil in a form in which it would become available to all plants.

That the turning of organic matter into the soil may make potash available was shown by Hopkins and Aumer(15), who for five years carried on an experiment in growing clover on soil from which all soluble potash had been extracted. The first year almost no growth was made, but after two years' green manuring, sufficient K was liberated from the soil minerals to enable the clover to be benefited by lime and phosphatic fertilizers, and to give good yields.

Moser(14) also has shown that green manuring makes P and K more available for crop production. In experiments in South Carolina, untreated soils contained 16 p.p.m. of available P, 25-30 p.p.m. being found in

soils to which leguminous plant material had been added. The replaceable-K content varied from 48 to 64 p.p.m. in untreated soils, and from 136 to 188 p.p.m. in legume-treated soils. The K absorbed by the colloidal complex of the soil was undoubtedly derived from the K released by the organic matter. Tam and Magistad(19) concluded that an increased potash content of soils from decomposing pineapple trash was directly associated with the potash content of the added plant material. Organic matter, therefore, either added to or grown on soils increases the available K of the surface soil and this is partly responsible for the increased yields.

Tam and Magistad also found a decrease in soluble P during the decomposition of organic matter, but unavailable P was eventually released. They attributed the decrease in soluble P to the utilization of the element by micro-organisms during the active period of organic-matter decomposition.

Lockett(10) observed an initial increase not only in the total-P content but also in the organic-P content of decomposing clover and rye, followed by a decrease in the organic-P content as decomposition advanced. The age as well as the nature of the plant influenced the conversion of inorganic P into organic forms during decomposition. It was concluded that during the process of decomposition the P was assimilated by micro-organisms and became immobilized in the form of lipids, nucleo-proteins and other organic compounds. Later, however, it again became available on the disintegration of the organic P compounds after death of the microbial cells. The process of fixation of P in microbial cells and of the subsequent liberation is important in that it provides a steady supply of available P for plant nutrition. If the P were liberated immediately in the soil, a large proportion might become permanently fixed in unavailable forms.

It appears, therefore, that the decomposition of organic matter with the release of its contained nutrients is the function that stimulates crop growth, and the chief benefits of green manuring are obtained when conditions are established for the complete destruction of the green manure by decomposition(12).

On porous soils in temperate regions winter cover crops are needed to hold the nutrients released by the decomposition of a summer green manure until the next season's crop can utilize them. For example, a winter cover crop of rye would absorb the nutrients provided by ploughing under a summer green manure and would hold them during the winter, releasing them when ploughed under in the spring and allowed to decompose(11).

Lewis and Hunter(9) state that the most economical system of using green manure is one in which the most important cash crop follows the green-manure crop. Laubscher(8) considers that the most important desiderata in a green-manure crop are that it must increase the ensuing crop to such an extent that its application will be profitable, that it must not compete with the main crop for soil, and that it must be suited to the particular area.

SUMMARY

The principal way in which green manuring benefits the soil is by the mobilization of plant nutrients absorbed by the green manures, and released during subsequent decomposition. Soil minerals may also possibly be mobilized by the action of carbon dioxide produced during decomposition of the green manure.

As, however, some cases of increased yields, as a result of green manuring, cannot be explained on these grounds, it may be noted that the beneficial effects of green manures have also been variously attributed to auximones, plant vitamins, various growth-promoting substances and improved iron nutrition.

H.S.

REFERENCES

(1) Andrews, W. B. The response of crops and soils to fertilizers and manures. *State College, Mississippi*, 1947.

(2) Batchelor, H. W. *Ohio Agric. Expt. Sta. Bimo. Bull.* 28, No. 221, 1943 (60-63).

(3) Blair, A. W., Prince, A. L. *N.J. Agric. Expt. Sta. Bull.* 677, 1940, pp. 8.

(4) Browning, G. M., Milam, F. M. *Soil Sci.* 57, 1944 (91-106).

(5) Faulkner, O. T., Mackie, J. R. West African Agriculture. Cambridge, 1933.

(6) Haylett, D. G. *Farm. S. Africa* 18, 1943 (627-636).

(7) Joachim, A. W. R. A manual of green manuring. *Colombo*, 1931 (5-34).

(8) Laubscher, F. X. *Farm. S. Africa* 18, 1943 (637-640).

(9) Lewis, R. D., Hunter, J. H. *J. Amer. Soc. Agron.* 32, 1940 (586-601).

(10) Lockett, J. L. *Soil Sci.* 45, 1938 (13-24).

(11) McKaig, N., Jr., Carns, W. A., Bowen, A. B. *J. Amer. Soc. Agron.* 32, 1940 (842-852).

(12) McVickar, M. H., Batten, E. T., Shulkcum, E., et al. *Proc. Soil Sci. Soc. Amer. 1946*, 11, 1947 (47-49).

(13) Martin, W. S. *Emp. J. Expt. Agric.* 12, 1944 (21-32).

(14) Moser, F. *J. Amer. Soc. Agron.* 34, 1942 (711-729).

(15) Pieters, A. J. Green manuring. New York, 1927.

(16) Pinck, L. A., Allison, F. E., Gaddy, V. L. *J. Amer. Soc. Agron.* 40, 1948 (237-248).

(17) Prianishnikov, D.N. Agrokhimia. Moscow, 1940.

(18) Russel, J. C. *J. Amer. Soc. Agron.* 21, 1929 (960-969).

(19) Tam, R. K., Magistad, O. C. *Soil Sci.* 41, 1936 (315-327).

(20) Theron, J. J. Green manuring. *Pretoria*, 1936.

EARTHWORMS

(*Harnessing the Earthworm. By T. J. Barrett. Faber and Faber, London.* 1949. *Pp.* xvi + 166. *Price* 12*s.* 6*d.*)

This book is one of those which put more emphasis on the romance than on the drabness of soil. Many such books have been published in the last few years, and though they may have done little to throw the pure light of science into the dark crevices of the soil any one of them has done far more than all the respected, orthodox text-books to arouse and maintain the latent interest of the layman in the everlasting mystery of the year's harvest. Nobody seeking inspiration in the working of his farm or garden would find it in the standard books on soil science. Physicists, chemists and biologists have written drama and romance into their sciences without infringing the canons of orthodoxy, but no soil scientist has yet succeeded in being faithful to his mistress and depicting her as the attractive jade she is. The heretics, however, have done so, and are winning hundreds of new adherents every day.

Dr. Barrett has made an excellent drama out of the activities of earthworms. His book makes no pretence to be scientific, but he has a profound, almost naive respect for the utterings of those with letters after their names. The reader needs to be careful to distinguish between statements of fact and just statements unsupported by factual evidence. Among many of the latter are the statements that all human food is derived from humus, that earthworms are killed by fertilizers and that resistance to pests and plant diseases is increased by earthworm activity. The first two are demonstrably false, and the third is undemonstrable.

But even without these embellishments of an enthusiast the facts are dramatic enough. Dr. Barrett and several other Americans whom he quotes at length have cultivated earthworms on an intensive scale and built up earthworm populations estimated to run into millions per acre foot. The results have been an extraordinary development of those favourable soil properties which are known to result from earthworm activity—the digestion of organic residues and their incorporation into the mass of the soil, an improvement in soil structure, an enhanced availability of plant nutrients in the worm casts, a decrease in soil acidity, etc. Remarkable increases in soil productivity have resulted. Admittedly the results when shorn of all frills are not quite so dramatic as on the first reading, but they are impressive enough. Whether or not earthworm farming is a more efficient method of increasing fertility than, say, fertilizer placement is not clear from the data given, but earthworm farming has real thrills and human interest which must be set in the scales as positive factors in its favour. This book will arouse a far greater desire to learn more about the biology of the soil than would all the volumes that have been written on carbon-nitrogen ratios, uronic acids and even base exchange.

The middle part of the book, which contains instructions for the breeding and care of these useful little pets, is where Dr. Barrett is most sure of his ground.

TROPICAL AGRICULTURE

(*A Handbook of Tropical Agriculture. By G. B. Masefield. Clarendon Press, Oxford.* 1949. *Pp.* viii + 196. 12*s*. 6*d*.)

This readable and authoritative handbook is arranged in four sections, of which the first sketches the main facts about tropical soils and their conservation, tropical land use and tenure, implements and haulage, irrigation, marketing, transport, labour and co-operation, and provides the general background of slow, laborious and primitive activity.

In the crop section, of about 100 pages, informative and well-arranged summaries, varying in length from a few pages to a few lines, according to importance, are given of the characteristics, cultivation and uses of some 200 crops. This section, like the whole book, is well served by a good index, each crop being indexed under all its native, European and systematic names. The third section gives a simple, illuminating outline of the methods by which the menace of tropical plant diseases and pests is met, and the last 30 pages, on livestock—their diseases, feeding and improvement, the shortcomings of tropical meat and the hazards of milk (often filthily watered, even with cattle urine)—are particularly revealing of tropical problems and of the potentialities of mixed farming, which is unknown in much of the tropics, but capable of leading to increased total production.

The author states that the handbook is intended mainly for farmers, business men and administrators, and not for the specialist requiring the most up-to-date findings on any matter. It seems, however, well suited also to meet the growing interest of ordinary citizens—provided with a very elementary knowledge of agriculture and its related sciences—in tropical food production and tropical affairs generally, and should find a place in any reference library. It should be much in place, too, on the study table of any teacher of geography or general knowledge in secondary schools: it is full of facts of the kind that snares interest and starts many lines of thought. A fuller discussion of the nature of and the problems set by the practice of shifting cultivation, and of the alternatives that are being studied would add to this general cultural value, and a short bibliography of some of the more specialized works to which the author notes his indebtedness would be helpful in further reading.

W.D.B.

SUMMARY OF REPORTS

Reports received include: British Cotton Growing Association Report 1948; *British Guiana*, Department of Agriculture, Report on Crop and Livestock Census 1947; *British West Indies*, Central Sugar Cane Breeding Station, Barbados, Report 1945-46; *Canada*, Report of the Minister of Agriculture 1947-48; Ontario Agricultural College and Experimental Farm Report 1946 and 1947; Prince Edward Island Department of Agriculture Report 1947-48; Dominion Experimental Station, Saanichton, B.C., Progress Report 1937-1946; *Colonial Office*, Colonial Annual Reports 1947 for Aden, Basutoland, Bermuda, British Guiana, Gambia, Gold Coast, Kenya, Mauritius, Nigeria, St. Helena, St. Vincent, Sarawak, Trinidad and Tobago; *Imperial Forestry Institute*, University of Oxford, Report 1947-48; *Imperial Institute*, London, Report 1948; *Indian Central Cotton Committee*, Report 1947-48; *Mauritius*, Department of Agriculture Report 1947; *New Zealand*, Department of Scientific and Industrial Research Report 1948; *Nigeria*, Report on the Agricultural Department 1946; Oil Palm Research Station, Nigeria, Report 1946-47; *Nyasaland*, Department of Agriculture Report 1947; *Southern Rhodesia*, Annual Report of Experiments 1946-47; *Southern Rhodesia Tobacco Research Board*, Summary of Annual Report 1947-48 [in *Rhod. Agric. J.* 45, 1948 (443-453)]; Union

of *South Africa*, Division of Meteorology Report for 1942, published 1948; *Tennessee Valley Authority*, Report 1947-48; *West African Cacao Research Institute, Tafo*, Quarterly Report Oct.-Dec. 1948; *United States Experiment Stations*: *Florida* 1946-47; *Georgia* 1947-48; *Maine*, Potato Research Station, Orono, Report of Progress 1947-48; *North Carolina* 1947; *Pennsylvania* 1947-48; *West Virginia* 1946-48.

Canada.—*Report of the Minister of Agriculture.*—Distribution of micro-organisms in rhizosphere; rhizosphere effects of different crops. Azotobacter as fertilizer for cultivated plants. Soil micro-organisms in relation to Mn deficiency and to potato scab. Use of cover crops and incorporation of soybeans in potato-scab-infested soil for control of soil-borne pathogens. Reclamation of saline soils. Investigations on the composition of the colloidal fraction of soils and the constitution of their organic matter. Minor elements and the effects of fertilizers on their intake. Use of waste-sulphite liquor as a soil dressing. Investigations on problems affecting maintenance of organic matter in dryland and irrigation farming. Collection of run-off data and analysis of hydro-metric records. Soils, cropping systems and fertilizers for tobacco. Fertilizers for permanent pastures.

Ontario Agricultural College.—In microbiological studies of mulch soils, the soil perfusion technique provides a rapid method of determining the nitrifying capacity of soils. Addition of a mulch legume hay to soil stabilizes the nitrifying organisms at a maximum level. Investigations on the influence of soil and climate on oil and protein in soybeans. N top-dressing for winter wheat; methods of application. N side-dressing for canning corn. Fertilizers in relation to lodging of spring grain. Minor-element fertilizers for carrots. Mn availability in soils.

Dominion Experimental Station, Saanichton.—Comparison of heavy clay loam, light sandy clay and light black loam for bulb and flower production. Survey of soils of Vancouver Island. Use of paper mulch for melons and its effect on soil organisms, temperature and moisture; comparison of effect of colour of paper. Sod versus clean cultivation; hay mulch for orchards. Couch-grass eradication by cultivation.

Imperial Forestry Institute, Oxford.—Investigations of processes involved in infection of tree roots by mycorrhizal fungi. Use of soil-metabolism methods for problems of dynamic equilibrium between "mull" and "mor". Studies of soil-water relationships and soil-air-water relationships with reference to humus types and properties. Soil-fauna, moisture and temperature investigations on undisturbed heathland, cultivated heathland recently planted with Sitka spruce, and cultivated heathland with older spruce.

Mauritius.—Investigations of the fertilizer value of crushed basaltic rock as a supplier of K, Ca and Mg. Manurial and fertilizer experiments for tobacco seed beds.

New Zealand.—*Cawthron Institute.*—Land-utilization survey. Effect of steam, chloropicrin and D-D on N and base status of tomato soil. Effect of compost and cocoa-bean husks on tomato yields.

Canterbury Agricultural College.—Study of *Actinomyces* spp. in soil. Studies of fineness of grinding and physical properties of limestone, response of crops to soil acidity, and bulk lime spreading.

Soil Bureau.—Use of radioactive P as tracer. Soil corrosion of pipe lines. Investigations of soil structure of deteriorating cropping lands. Soil ecology. Use of beans, radish and beet as indicator plants for determination of available B in soil. Use of *Aspergillus* method for evaluating available Cu in soils.

Nigeria.—*Oil Palm Research Station.*—Experiments on burning versus non-burning and maintenance of soil fertility and yields. Fertilizer trials with lime, farmyard manure and woodash. Deep-ploughing and mulching experiments.

Southern Rhodesia.—*Report of Experiments.*—Effect of rotations and fertilizers on yield of maize, soybeans and groundnuts. Use of velvet bean, Sesbiania, Mungo and Sudan grass as green manure as substitutes

for sunnhemp. Effect of different intervals between applications of green manure. Residual effect of legume crop on the following crop of maize.

Southern Rhodesia Tobacco Research Board.—Methods of applying fertilizers. Chloride poisoning with applications of 64 lb./acre of KCl. Control of root-knot nematode; effect of rotations with groundnuts and cotton; effect of time of ploughing on new nematode population.

West African Cacao Research Institute, Tafo.—Influence of methods of application of super. on bearing cacao. Experiments on the efficacy of maize as a soil-fertility-indicator plant.

United States Experiment Stations

Florida.—Interrelationship between microbial action in soils and cropping systems. Studies of effects of combined N on nodulation and growth of legumes, the effect of different degrees of Ca saturation on N fixation and utilization of combined N by sweet clover, and the absorption of N by peanut gynophores. The effect of soil reaction and organic-matter content on retention and availability of major nutrient elements. Effect of chemical and physical characteristics of Florida soils on the mineral composition of vegetables. Availability of P from various phosphates applied to different soil types; use of radioactive P. Retention and utilization of B in Florida soils. Survey of distribution of Mo in muck soils. Effect of Cu on sugarcane; S-Mn studies; effect of soil sterilization and pH on Mn availability; use of S on peat and muck soils.

Georgia.—Fertilizers and spacing tests for maize. Rates and kinds of lime for cotton; where no K was used lime did not increase yield. Comparison of sources of P for cotton. Comparison of residual effects of vetch and $NaNO_3$ for cotton. Fertilizers for lespedeza and fescue for permanent pasture; complete fertilizer high in N (10-10-10) produced the best early winter grazing. Effect of soil and weather on nutritive value of vegetables.

Maine Potato Research Station.—Effect of KCl and K_2SO_4 on quality and yield. Radioactive-P fertilizer tests. Effect of liming acid soils on efficiency of P applied. Comparison of different rates of application of N. Response of potatoes to Zn. Maintenance of soil organic matter by light mulching after planting potatoes. Irrigation of potatoes. Chemical weed control.

North Carolina.—Early row fertilization for maize. Response of lespedeza and soybeans to lime and fertilizers. Lime and land plaster increased the filling of groundnuts. Investigations for control of grape chlorosis by adding Mg to fertilizer or liming materials. Use of radioactive materials in study of fertilizer needs. Use of kudzu in rotation with maize on eroded land.

Pennsylvania.—Trials with mouldboard plough, disc plough, TNT plough and rotary plough showed little difference in potato yields. Reforestation of spoil banks. Clay-mineral content of soils may be an indication of K deficiency. Use of stems and pomace as substitute for barnyard manure on grapes. Soil-moisture content greatly influences soil structure. $CuSO_4$ in fertilizer suppressed tobacco quality. Drought affected response of tobacco to applied K.

West Virginia.—Development of measles in apple trees on soils high in available Mn. Lucerne may require B.

ABSTRACT SECTION

NOTE.—A capital letter in square brackets following the reference denotes the language in which the paper is written. A small letter denotes a summary in another language, e.g. [G.e.]—German, with English summary. English [E.] is only indicated for papers published in journals usually written in foreign languages. Where the Bureau has only seen an abstract, and not the original paper, no language indication is given.

Original (untranslated) titles of papers are only given where the Latin script is used.

Where more than one reference is given, the first is to the original paper, the others to notices in abstract journals. A key to the abbreviations used in the references is contained in the Bureau's *Bibliography of Soil Science, Fertilizers and General Agronomy.*

631.3 AGRICULTURAL EQUIPMENT

(*See also* Abs. No. 902)

[789] 631.347.24

FARM IMPLEMENT AND MACHINERY REVIEW. **A new principle of artificial irrigation.** *Farm. Impl. Mach. Rev.* 74, 1949 (1061-1062).

A simple portable type of sprayer, patented but not yet in production, is described in which a short upright pipe with spreading and atomising devices at the top is caused to wag from side to side and cover a square area, thus eliminating the overlapping occurring with the rotary sprayer.

[790] 631.347.24

FARM MECHANIZATION. **Irrigation equipment.** *Farm. Mech.* 3, 1949 (53-55).

Equipment available for overhead irrigation by spray-lines or sprinklers is described.

631.4 SOILS

[791] 631.4 : 551.311.33 : 549

WHITESIDE, E. P. **Preliminary X-ray studies of loess deposits in Illinois.** *Proc. Soil Sci. Soc. Amer. 1947,* 12, 1948 (415-419). [Ill. Agric. Expt. Sta., Urbana]

The mineral content of several samples of loess from Illinois has been determined by microphotometry of X-ray powder photographs, using NH_4Cl as internal standard. As specimen, a horizontal cellulose-acetate tube, $\frac{3}{4}$ filled, was used, the "tumbling" of the powder during rotation evening out the diffraction from the coarser particles.

Quartz, feldspar, calcite and dolomite have been found in all samples. Peorian loess contains much more dolomite than underlying Sangamon loess, and somewhat less felspar, on a carbonate-free basis. The calcite content is small, except in lime concretions, where it is dominant. Dolomite in the Sangamon loess is probably original.

D.M.C M.

[792] 631.4 : 551.481

MORTIMER, C. H. **Underwater 'soils': a review of lake sediments.** *J. Soil Sci.* 1, 1949 (63-73). [Freshwater Biol. Assoc., Ambleside, England]

Underwater sediments may be regarded as soils of a special type differing from subaerial soils in that they are continuously being generated by sedimentation, that they are normally left undisturbed, and that they are permanently waterlogged. The author reviews the very variable factors operating in lake-sediment formation, and the role of sediments in lake "metabolism". The most productive sediments are associated with shallow depth and a base-rich medium. A lake situated in a rich agricultural area is usually highly productive. Little is known of the microbiology of sediments, but it is known that the numbers of bacteria in them are very large compared with those in the water.

631.41 SOIL CHEMISTRY

(*See also* Abs. Nos. 842, 875, 900, 976)

[793] 631.411.2 : 631.434

CHARLES, G. Sur la formation de la carapace zonaire en Algérie. **[The formation of the zonal carapace in Algeria.]** *C.R.* 228, 1948 (261-263). [F.]

The formation of the zonal carapace is attributed to the action of roots. The roots of plants, particularly those of trees, spread themselves on the surface of the calcareous layer. The absorption of water by the roots brings about precipitation of the dissolved calcium carbonate owing to the concentration of the solution. The zonal crust is always absent when the underlying calcareous rock is more permeable than the surface soil or when the soil is sufficiently thick to prevent all but the deepest roots from reaching the calcareous rock. With the disappearance of vegetation such as forest the zonal carapace also disappears.

[794] 631.411.4 : 631.431

ELLIS, N. K. **Crop and water relations on muck soils.** *Veg. Grow. Assoc. Amer. Rept.* 1947 (93-100). Biol. Abs. 22 (2547). [Purdue Univ., Lafayette, Ind.]

Where the water table was maintained 38 inches below the surface the average rate of subsidence of the soil during 2 years was a little over $\frac{1}{10}$ of a foot/year. Where the water table was 27 inches below the surface the subsidence was $\frac{1}{10}$ foot/year and at 16 inches there was no measurable subsidence.

[795] 631.411.4 : 631.5

POLAK, B. Landbouw op veengronden. **[Agriculture on peat soils.]** *Landbouw* 20, 1948 (1-50). [Du.e.] [Bodemk. Inst. Alg. Proefst. Buitenzorg]

Impressions received during a visit to the cultivated peat areas of Florida, New York and Michigan are described with reference to climate, chemical composition of the peat, drainage, development, trace elements, manuring and crops. It is suggested that the peat areas of Indonesia could be similarly developed.

[796] 631.413 : 631.415.1

SCHOFIELD, R. K. **Effect of pH on electric charges carried by clay particles.** *J. Soil Sci.* 1, 1949 (1-8). [Rothamsted]

The net negative charge carried by an illitic subsoil clay was determined by repeatedly shaking a sample of the subsoil with a solution n/5 in NH_4Cl and n/1000 in HCl until equilibrium was reached. The sample was then washed five times with n/5 KNO_3, the washings were bulked and titrated to pH 6, and analysed for NH_4 and Cl. In calculating the net negative charge it was assumed that the proportion of free H_3O ions (which had to be taken into account) to NH_4 ions was 1 : 200 (same as in the NH_4Cl solution). The net negative charge varied from 21.5 m.e./100 g. of oven-dried subsoil at pH 2.05 to 28.2 at pH 7.4. Measurements of Cl adsorption showed that the increase in charge between pH 2.5 and pH 6 was due to a fall in the number of positive charges (which approached zero at pH 5.5), and between pH 6 and 7.5 to an increase in the negative charges.

Pretreatment with acid ammonium oxalate which removed free alumina and, in sunlight, large quantities of ferric oxide, increased the net negative charge at pH 3 by 2 m.e./100 g., whereas the Cl adsorption had the same (negative) value at pH 3 and pH 7. These results show that there is a component (presumably hydrous ferric oxide) dissolved by acid oxalate that carries positive charges at pH 3, but not at pH 7. The clay mineral itself was not attacked by acid oxalate.

[797] 631.414 : 631.415.1

HOYOS DE CASTRO, A.; PASCUAL TALAVERA, M. Influencia del pH sobre las propriedades de suspension de materiales arcillosos. **[Effect of pH on the suspension properties of clay materials.]** *An. Inst. Esp. Edafol.* 7, 1948 (273-313). [Sp.]

For several bentonites, one of which was separated into 4 grain-size fractions, and a sample of kaolin, measurements were made of (a) stable sedimentation volume, (b) time taken to reach this volume, (c) sedimentation velocity at 4 hours, when these materials were suspended in distilled water and in buffer solutions of pH 1.19-10.

With the bentonites as compared with kaolin (a) and (b) were high and (c) low. The different bentonites showed considerable differences among themselves and grain

size affected the results. With increase in base-exchange capacity and thixotropy, (a) and (b) increased and (c) decreased. The colloidal properties were most marked in the case of distilled water, and with the buffered solutions depended markedly on the concentration and nature of the electrolytes. Except possibly for the kaolin and a bentonite fraction $> 1.12\ \mu$, dispersion was highest at about neutral pH with low electrolyte concentration and the presence of Na ions and lowest at pH 9.1 with a higher electrolyte concentration and the presence of Cl and NH_4 ions. The general pH sequence for all samples for (a) and (b) was 7.18, 7.9, 3.1, 1.19, 4.65, 10 and 9.1, the reverse order holding for (c).

[798] 631.414.05 : 631.445.7
HOORE, J. D'; FRIPIAT, J. Sur quelques phénomènes de dispersion des colloides dans les sols du Congo. **[Certain dispersion phenomena of colloids in Congo soils.]** *C.R. Sem. Agric. Yangambi* 2, 1947 (636-649). [F.]

A method for dispersing tropical soils rich in iron hydroxide is described. 5 ml. of CCl_4 were added to 5 g. of soil contained in a Truog tube. After half-an-hour a few drops of water were added and the whole shaken gently. The coarse suspension flocculates and as much as possible of the liquid is decanted off. A few drops of water are added again and the whole procedure is repeated until all the suspended matter is spread along the wall of the tube, and the liquid appears to be a clay suspension. Then more water is added, the whole well shaken and separated by decantation. This method was satisfactory for the dispersion of most soils, but failed with certain savanna soils which were very rich in organic matter (up to 8% C) and formed in a much more temperate climate.

[799] 631.414.2
ALEIXANDRE FERRANDIS, V.; GARCIA VICENTE, J. Estudio fisico-quimico de algunos silico-aluminatos artificiales. **[Physico-chemical study of some artificial silico-aluminates.]** *An. Inst. Esp. Edafol.* 7, 1948 (135-161). [Sp.f.e.]

The silico-aluminates were obtained by precipitation and had SiO_2/Al_2O_3 ratios between 13 and 7.4. Base-exchange capacity was high, with a maximum at the SiO_2/Al_2O_3 ratio of 8.6. The adsorption isotherms of water vapour were of the multimolecular adsorption type in which the adsorbed quantity increases indefinitely on approaching saturation pressure and are completely analogous to those of clay. The dehydration curves show great loss of water up to 100°C, moderate loss from 100° to 500°C and considerable loss from 500° to 700°C especially with high molecular ratios. The neutralization curves are very similar to those of weak acids and similar to those found with soils.

[800] 631.414.2
ALINARI, E. **Function and state of the colloidal constituents of soil in relation to its fertility.** *Ann. Chim. Appl.* 38, 1948 (212-234). B.A.B III, 1948 (310).

The nature and function of the colloidal material, the importance of its state of saturation in respect of fertilizers and the classification of soils on a basis of the state of saturation are discussed.

[801] 631.414.2 : 537.531
WILLIS, A. L.; PENNINGTON, R. P.; JACKSON, M. L. **Mineral standards for quantitative X-ray diffraction analysis of soil clays: I. Abridgement of component percentages based on weathering sequence.** *Proc. Soil Sci. Soc. Amer. 1947*, 12, 1948 (400-406). [Univ. Wisconsin, Madison]

The authors suggest the use of a series of standard mixtures for quantitative interpretation of X-ray diffraction patterns of soil clays by direct comparison. In order to limit the number of standards needed, use is made of the conception of the "weathering sequence" (Hellman, Tyler, Willis, et al., *J. Phys. Coll. Chem.* 52, p. 1237). The mixtures used consist of neighbouring members of this sequence, with one mineral usually dominant, and lesser amounts of minerals of the previous, "receding" stage (corresponding to less intense or prolonged weathering), and of the following "ascending" stage (corresponding to more intense or prolonged weathering). The sequence used is hornblende, chlorite, albite, quartz, illite, "mica-intermediate" (a mineral with limited *c*-axis expansion), montmorillonite, kaolonite, gibbsite, haematite (and/or goethite); the first two occurring only in the coarser clay (2-0.2 μ), and always "receding". Tables of composition of the standards are given, and several samples of X-ray photographs.

D.M.C.M.

[802] 631.414.2 : 537.531
MACEWAN, D. M. C. **Some notes on the recording and interpretation of X-ray diagrams of soil clays.** *J. Soil Sci.* 1, 1949 (90-103). [Rothamsted]

Recommendations for special points in the technique of taking, and in the interpretation of, X-ray photographs.

[803] 631.414.2 : 549
MACAULAY INSTITUTE. **The soil-clays of North-east Scotland.** *Macaulay Inst. Rept. 1947-1948*, 1948 (10-11).

Soils derived from basic and ultrabasic parent material tend to contain montmorillonitic clay minerals under wet conditions and vermiculitic and kaolinitic types under free-drainage conditions. In soils derived ultimately from acid and intermediate rocks, drainage seems to have little influence in conditioning the types of clay minerals present; they are normally kaolinites, illites and vermiculites. The study of the decomposition of biotite by natural processes was a necessary preliminary to the elucidation of the mineralogical nature of the soil clays where a corresponding breakdown of a clay mineral similar to biotite takes place. The "clay biotite" which usually occurs with its decomposition products in mixed-layer structures is widely distributed in soil clays. Under free-drainage conditions the "clay biotite" breaks down to form vermiculite, but in poorly-drained areas the product is a trioctahedral montmorillonite. Both of these products break down further to give a member of the kaolinite group of minerals. The kaolinites show a general tendency to increased development towards the surfaces of the profiles and they may form mixed-layer structures with the "clay biotite" and its decomposition products. Non-crystalline hydrated oxides of Fe and Al are important constituents of some of the soil clays of this area.

The high cation-exchange capacity of many of the soil clays is traceable to vermiculites and it is probable that the high exchange capacity shown by the silt and sand fractions of many soils in this area is caused by vermiculites which expand or exfoliate when heated.

[804] 631.414.2 : 549 : 631.414.3
EDELMAN, C. H. Over de betrekkingen tussen de eigenschappen en de kristalstructuur van enkele kleimineralen. **[On the relationships between the properties and crystal structure of some clay minerals.]** *Landbouwk. Tijdschr.* 60, 1948 (221-227). [Du.]

The structural features of kaolinite, pyrophyllite and montmorillonite that govern their absorption properties are discussed. Brief reference is made to the origin of clay minerals, and especially to Hardon and Favejee's study of Javan soils.

[805] 631.414.2 : 549.1
PENNINGTON, R. P.; JACKSON, M. L. **Segregation of clay minerals of polycomponent soil clays.** *Proc. Soil Sci. Soc. Amer. 1947*, 12, 1948 (452-457). [Univ. Wisconsin, Madison]

Grain-size separation with the bucket centrifuge has been used for separating mineral components of soil clays. The fractions used, and the minerals which tend to concentrate in them are: 5-2µ (albite, quartz, sometimes illite, some kaolinite); 2-0.2µ (rarely albite, some quartz, illite, kaolinite); 0.2-0.08µ (very little quartz, sometimes illite, mica-intermediate, montmorillonite, kaolinite); $>$ 0.08µ (mica-intermediate, montmorillonite). [Mica-intermediate is a micaceous mineral with less *c*-axis expansion than montmorillonite.]
—D.M.C.M.

[806] 631.414.2 : 631.483
TIULIN, A. F.; MALOMAKHOVA, T. A. **[A comparative study of the different means of coating coarsely dispersed clay minerals by sesquioxides.]** *Pochvovedenie* 1948 (689-697). [R.]

A study was made of the process of fixation of sesquioxides on the surface of clay minerals, such as kaolin, in the soil. It is probable that the coating of the surface of coarsely dispersed particles by films of iron hydroxide may occur by (1) the formation of "crusts" on the surface of silicates by the weathering of the surface layers of the silicates, and (2) the adsorption from solution of easily soluble Fe salts, which become firmly fixed by being converted into oxides. The accumulation of sesquioxides on the surface of coarsely dispersed particles is favoured by conditions of abundant moisture and by growth of meadow vegetation.

[807] 631.414.2 : 631.821.1 : 631.86
BISHOP, R. F.; ATKINSON, H. J. **Soil colloids. V. Effect of field applications of lime and manure.** *Sci. Agric.* 28, 1948 (577-583).

The colloidal content of the soil was not appreciably affected by either limestone or manure.

[808] 631.415.1 : 545.372
BOSWELL, J. G. **Observations on the measurements of hydrogen-ion concentration in soils.** *Soil Sci.* 67, 1949 (23-27). [Univ. Sheffield]

Substantial differences were observed between the pH values recorded by the quinhydrone and glass electrodes for a number of soils under similar experimental conditions. An explanation has been provided by considering the effect of the redox systems in the soils on the HQ/Q ratio in the quinhydrone system. Maintenance of this ratio at a constant value, customarily unity, is essential if the values recorded with the quinhydrone electrode are to be correct measurements of the pH of the soil. The pH of any soil containing a redox system that disturbs this ratio cannot be determined accurately by this system.—Author's abstract.

[809] 631.415.1 : 631.414.3
TRENEL, M. Wesen und Bedeutung der Austauschazidität des Bodens. **[The nature and significance of the exchange acidity of the soil.]** *Ztschr. Pflanz. Düng.* 37, 1946 (205-221). [G.]

A summary is presented of knowledge of the cause of exchange acidity and of its plant physiological effects. The formation of soluble Al by the effect of NH_4 or K salts is explained in the equation $Al(OH)_3 + 3KCl \leftrightarrows AlCl_3 + 3KOH$. In the presence of silicic-acid gel or humus gels lacking bases, the formation of $AlCl_3$ is favoured. The "exchange-acidity principle" may be extracted by cold 1% NaOH. 20.8% of the material is mineral and is composed half of silicic acid and half of hydrated Al and Fe oxides. H ions at the concentrations occurring in normal soils are not responsible for growth injury and facilitate nutrient uptake; in soils of pH <5 the H concentration renders Al soluble.

The Al specifically disturbs primary assimilation and remains on or in the root; its toxicity is not due to any lack or excess of plant nutrients in the cell and is not counteracted by Ca.

[810] 631.415.3 : 631.48
DROUINEAU, G.; GOUNY, P.; LEFÈVRE, G. Sur les conditions particulières de formation d'un sol à alcalis. **[The conditions of a particular case of alkali-soil formation.]** *C.R. Acad. Agric.* 34, 1948 (565-567). [F.]

Areas of alkaline soils of pH 8 occur on the non-calcareous alluviums, of pH 5.4-6.9, and low in clay and silt, of the Reyran Valley (Var) although Cl content, expressed as NaCl, is only 0.013%. The formation of these areas is due to poor drainage conditions, the cessation of irrigation and the ascent of soil solution during the Mediterranean summer; their topsoils show a great enrichment of K, Mg and especially of Na, the percentage saturation by Na being well above 10.

[811] 631.415.36
TALATI, R. P. **Field experiments on reclamation of salt lands in Baramati of Bombay Deccan.** *Indian J. Agric. Sci.* 17, 1947 (153-174). [Poona Irrig. and Res. Div., Bombay]

In the reclamation experiments described the water table was lowered to a depth of more than 4 feet by drainage followed by ploughing and levelling. During the monsoon, when the area received 160 inches of water, the salt content was reduced from 3% to less than 1%, pH values were decreased in the top 6 inches and increased in the lower horizon, and humus was depleted. Except for an appreciable increase in pH values similar results were observed in alkaline soils after applying a total of 275 inches of irrigation water in 3 seasons. Studies were made of the tilth, pH and salt content of numerous samples of reclaimed soil supporting sugar cane which varied considerably in growth. Tilth, as indicated by capillary rise, was good up to pH 8.6 beyond which it deteriorated rapidly. Yields were reduced at the higher pH values and certain varieties of cane were more suitable than others. Farmyard manure at rates of 10,000 to 50,000 lb./acre was applied to soils with salt contents of 0.5% and pH

values of 8.5-9.0, and followed by two applications of 25 lb. each of $(NH_4)_2SO_4$ and groundnut cake and 50 lb. of castor cake. 10,000-30,000 lb. of farmyard manure slightly increased yields but 40,000 and 50,000 lb. were only effective on good soils; yields were reduced by the latter amounts on stiff, alkaline soils, due to inadequate aeration. Application of $CaSO_4$ at 2.3 tons/acre significantly increased yields. Various amendments were applied to stiff soils which, with a salt content of 0.47% and a pH value of 9.16, had been unable to support a crop. These amendments were $CaCO_3$, $CaSO_4$, S, sheep manure, farmyard manure, compost, oil cake and molasses applied singly and in various combinations. *Nilwa* and *khapla* were sown 6 months after the treatments, which were repeated the following year and the soil cropped to *shalu*. Salt content and pH values were lowered, tilth was improved and a normal crop of *shalu* was obtained; best results were given by $CaSO_4$ with farmyard or sheep manure. After 3 years the soils were restored to their normal condition. Of possible rotation crops for sugar-cane culture, *dhaincha* was most successful. Cotton improved the soil by its deep rooting system and yielded normally. *Shevari* and lucerne were promising while paddy was suitable for mixed saline soils but not for the stiff alkaline soils of the Deccan.

[812] 631.415.7 : 631.47

FINA, A. L. DE; GARBOSKY, A. J. Difusion geographica de cultivos indices en la Mesopotamia Argentina y sus causas. **[The geographical distribution of indicator crops in the Argentinian Mesopotamia and its causes.]** *Inst. Suel. Agrotec. Argentina Tir. Interna* 10, 1948, pp. 9 + 19 maps. *Mimeo.* [Sp.]

The distribution of the 18 crop plants used as criteria in the agro-ecological surveying of climatic and soil conditions (see *Soils and Fert.* 11 [863]) is discussed and mapped. In the 8 agro-climatic districts distinguished, the presence and quality of the various indicators give an exact idea of the possibilities for the growth of other crops whose requirements are known.

631.416 COMPOSITION OF SOILS

(*See also* Abs. Nos. 809, 887, 895, 991, 993)

[813] 631.416

HOORE, J. D'; FRIPIAT, J. Essai de classification des éléments d'un sol d'après un degré croissant de complexité. **[An essay in classifying the elements of a soil according to an increasing degree of complexity.]** *C.R. Sem. Agric. Yangambi* 2, 1947 (670-671). [F.]

Soil components are classified according to an increasing degree of molecular complexity and the results are presented in a table.

[814] 631.416 : 55

COLLIER, D. Influence prépondérante de la roche mère sur la composition chimique des sols d'Auvergne. **[Dominant effect of the parent rock on the chemical composition of Auvergne soils.]** *C.R.* 228, 1949 (115-116). [F.]

The chemical compositions of the main soil types of Auvergne were distinct for each type and related to the parent rock from which each soil was derived. The types examined comprised mountain soils of granitic and basaltic origin, Limagne soils derived from quartz and K felspar, and black earths formed by the decalcification of calcareous clays. Data, which are tabulated, show that during soil formation the SiO_2/R_2O_3 and bases/R_2O_3 ratios were lowered.

[815] 631.416.2 : 631.414.3

BARBIER, G.; CHABANNES, J.; DURROUX, M. Retour spontané à l'état mobile, dans le sol, de la fraction dite rétrogradée des engrais phosphatés et potassiques. **[Natural release in the soil of the fixed fraction of phosphatic and potassium fertilizers.]** *Ann. Agron.* 18, 1948 (521-527). [F.] [Sta. Centr. Agron., Versailles]

The soil used was a clay loam of pH 6.3 containing 3.9% of organic matter. The ageing of super. for 10 years in the soil resulted in a transformation of dilute-acid-soluble P into a dilute-alkali-soluble form. The addition of lime water to soil which had received super. 10 years earlier did not cause much P to enter solution, but favoured a transformation of the alkali-soluble into the acid-soluble forms. Large quantities of the K applied to this soil became non-exchange-

able. On leaching out the exchangeable K (1) wetting and drying caused the release of some of the fixed K to the exchangeable form and (2) the presence of humic acids appeared, in preliminary experiments, to hinder such release.

[816] 631.416.2 : 631.414.3
BOISCHOT, P.; CHABANNES, J. Fixation de l'acide phosphorique sur le calcaire des sols. **[Phosphorus fixation on the calcium carbonate of soils.]** *C.R. Acad. Agric.* 34, 1948 (994-996). [F.]

Experiments with a soil containing 33% of $CaCO_3$ indicate that this fixation is due to an adsorption. With concentrated solutions, such as seen around the granules of phosphatic fertilizer, chemical precipitation can occur, but the precipitates redissolve, at least partially, in the soil solutions and become adsorbed upon neighbouring calcareous granules. (See also *Soils and Fert.* **XII** [389]).

[817] 631.416.2 : 631.414.3
MCAULIFFE, C. D.; HALL, N. S.; DEAN, L. A., ET AL. **Exchange reactions between phosphates and soils: Hydroxylic surfaces of soil minerals.** *Proc. Soil Sci. Soc. Amer. 1947*, 12, 1948 (119-123). [Cornell Univ.; N.C. Agric. Expt. Sta.; U.S.D.A. Beltsville]

The reversibility of phosphate reactions in acid soils that involve the hydroxylic surfaces of clay minerals and hydrous oxides may be tested by using the reaction:

surface PO_4-P^{31} + solution PO_4-P^{32} $\rightleftarrows$ surface PO_4-P^{32} + solution PO_4-P^{31}.

The rate of this reaction was measured for several soils with different levels of P fertility by shaking 5 g. of soil with 25 ml. of water and adding 1 ml. of a solution containing 25μC of carrier-free P^{32}. The specific activity of the solution was determined at intervals. Two reactions were involved. The first, in which the fraction P^{32} solid/P^{32} solution changed logarithmically with respect to time, corresponds to exchange between PO_4 in solution and PO_4 on the surface. After sorption PO_4 undergoes a further, undetermined reaction. The region where departure from the logarithmic rate occurs can be taken as a measure of readily exchangeable PO_4 that was found to parallel the levels of PO_4 fertility as estimated by Truog and Neubauer methods.

The specific hydroxylic surface of kaolinite halloysite, gibbsite, diaspore and goethite was measured by a method based on the exchange reaction:

Surface-OH + DOD $\rightleftarrows$ surface-OD + HOD

Results were compared with those obtained by the method of Brunauer, Emmett and Teller.

[818] 631.416.2 : 631.414.3
HANLEY, F. **Phosphate recovery by crops.** *Agriculture* 55, 1949 (524-528).

In some soils from 80 to 90 per cent of applied phosphate may be fixed in the soil in unavailable forms. Liming and the choice of a suitable fertilizer for soil and crop will influence P recovery. The time of application and the concentration and condition of the fertilizer, such as granulation and mixing with farmyard manure, are factors in determining percentage recovery. Soil micro-organisms may influence the availability of soil phosphates as shown by pot experiments in France.

[819] 631.416.2 : 631.414.3
SWENSON, R. M.; COLE, C. V.; SIELING, D. H. **Fixation of phosphate by iron and aluminium and replacement by organic and inorganic ions.** *Soil Sci.* 67, 1949 (3-22). [Mass. Agric. Expt. Sta., Amherst]

Potentiometric titration curves of Fe and Al chlorides in the presence of phosphate indicated that for each metallic ion 2 hydroxides and one phosphate ion reacted to give the basic phosphates $Fe(H_2O)_3(OH)_2H_2PO_4$ or $Al(H_2O)_3(OH)_2H_2PO_4$. The pH of maximum precipitation of Fe was 2.5-3.5 and of Al 3.5-4.0. The ratio of phosphate to Fe or Al in the precipitated compound was never $>$ 1.0 even when the amount of phosphate used was 9 times that of the metal. Fluoride and arsenate will replace chemically-combined phosphate, their effectiveness depending on the relative stability of the compounds formed and the concentration of the replacing anion, but phosphate is several times as effective in replacing arsenate and fluoride from Al, except when F/Al $>$ 6. Organic anions which form stable complexes with Fe and Al, including aliphatic hydroxy-organic acids and aromatic hydroxy-acids, were effective in preventing the combination of phosphate with Al and Fe or in replacing the combined phosphate. Humus and lignin replaced phosphate from the Fe compound.

[820] 631.416.2 : 631.811.2
SMITH, V. T. **An evaluation of the carbon dioxide method of determining available phosphoric acid in high lime soils.** *J. Amer. Soc. Agron.* 104, 1948 (1045-1046).

Most crops growing on high-lime soils in southern Idaho do not respond markedly to phosphate treatments when the soil already contains more than 25 lb./acre of available P_2O_5 as determined by the CO_2 method. Most crops respond to soluble P fertilizer if the soil contains less than 25 lb./acre.

[821] 631.416.2 : 631.85 : 631.62
MACAULAY INSTITUTE. **Phosphate relationships of soils.** *Macaulay Inst. Rept. 1947-48*, 1948 (22-23).

Ground mineral phosphate gave good results with turnips, swedes and pasture, but the highest yields were obtained from complete fertilizer containing super. as the source of P. It has been difficult to get accurate information on the P status of soils because of the complicating influence of variable drainage conditions. Poorly drained soils have higher contents of readily-soluble P than have freely-drained soils. Although the yield is lower than in well-drained areas, the poorly-drained soils respond markedly to additions of P. Lime increases crop yield and the readily-soluble P in the soils. Because of the high fixing power of most soils, it is probably sounder policy to apply moderate dressings of P for each crop than to attempt to build up P reserve in the soil by applying single heavy dressings at infrequent intervals. Fertilizers in granular form were as effective as those in powdered form.

[822] 631.416.322
GLEEN, H. **Some aspects of sulphur metabolism in soils.** *J. Gen. Microbiol.* 3, 1949 (xiii). [Long Ashton, Bristol]

Using a soil perfusion technique, a study has been made of the metabolism of thiosulphates, tetrathionate, trithionate and thiocyanate in soils.

[823] 631.416.4 : 631.414.3
STANFORD, G. **Potassium fixation in soils as affected by type of clay mineral, moisture conditions, and concentration of other ions.** Abs. in *Iowa St. Coll. J. Sci.* 23, 1948 (80-82).

Under moist conditions secondary micaceous minerals are responsible for rapid fixation of K in certain calcareous soils and for slow fixation in acid soils when K is added. In acid illite, Fe and Al ions present in certain lattice proportions greatly restrict the entrance of K, and hence little or no fixation occurs under moist conditions. Precipitation of Al ions as $Al(OH)_3$ or $AlPO_4$, or the formation of a soluble complex with fluoride ions greatly increased the amounts of K fixed by electrodialysed illite under moist conditions. That the precipitation of $AlPO_4$ was primarily concerned in the increase in fixation on addition of P was shown by the fact that P exerted an effect only in the pH range where precipitation occurs. The greater the amount of Al removed by complex formation with fluoride, the larger was the amount of K fixed.

When an acid-washed soil, formerly calcareous and no longer capable of fixing K under moist conditions, was treated with NaOH to raise the pH back to its former level, the capacity to fix K was partially restored, indicating that H ions as well as Al ions may inhibit K fixation in acid soils containing micaceous minerals. Rapid fixation of K in calcareous soils is explained by the fact that they contain Ca, Mg and Na ions in positions potentially capable of fixing K. On adding K, these ions are easily replaced and maximum fixation is attained within 48 hours.

Addition of lime and P fertilizer increases K fixation in illite clay under moist conditions and on drying, but decreases K fixation in montmorillonitic clay. Illite fixes appreciable amounts of K under moist conditions when pH is near or above neutral and considerably more is fixed when the mineral is dried. Montmorillonite fixes no K under moist conditions, but fixes large quantities on drying, particularly at pH values of 4-5.

The calcareous soils which fix large amounts of K under moist conditions are also capable of fixing NH_4 ions by the same mechanism. If NH_4 were fixed, the capacity for subsequently fixing K was correspondingly reduced, and fixation of K reduced the capacity for fixing NH_4.

[824] 631.416.872
SPEK, J. VAN DER. **[Iron in soil.]** *Chem. Weekbl.* 44, 1948 (493-499, 505-511). C.A. 43 (338). [Du.e.]

In samples of Dutch clays more than 70% of the Fe was contained in particles smaller than 2μ. The Fe is present in the form of illite, biotite, nontronite, glauconite, epidote, hornblende, augite, various weathering products of these minerals and amorphous and crystalline Fe hydroxides. Determinations of Fe in 4 soil profiles by Tamm's oxalate method accounted for only 7-25% of the Fe soluble in 10% HCl. The solution of Fe in oxalate was better in the presence of humic acids. $Fe(OH)_3$, especially in gel form, is less soluble than $Fe(OH)_2$; the solubility of $Fe(OH)_3$ is also reduced by a high content of $CaCO_3$. The migration of Fe as $Fe(HCO_3)_2$ in the soil and the factors affecting it are discussed.

[825] 631.416.872 : 631.414.2
MACAULAY INSTITUTE. **Physico-chemical investigations.** *Macaulay Inst. Rept. 1947-1948*, 1948 (11-12).

Thermograms obtained for soil clays have shed light on the nature of the free iron oxides present in the soil. Goethite and cold-precipitated ferric hydroxide have been observed in clays. Preliminary results of correlation of the type of iron oxide with conditions of soil formation indicate that there may be some correlation with drainage conditions.

[826] 631.416.877
VINOGRADOV, A. P.; VINOGRADOVA, Kh. G. **Molybdenum in the soils of the U.S.S.R.** *Dokl. Akad. Nauk S.S.S.R.* 62, 1948 (657-659). C.A. 43 (1890).

Mo contents ranged from 1.5×10^{-4} to 1.2×10^{-3} % with an average of 2.6×10^{-4}. The highest Mo content was found in the tundra soils of the Kola peninsula.

631.417 ORGANIC MATTER

[827] 631.417 : 631.86
KONONOVA, M. M.; PANKOVA, N. A.; BELCHIKOVA, N. P. **[The change in the content and composition of organic matter in cultivated soils.]** *Pochvovedenie* 1949 (28-37). [R.]

Samples of soils (podzol, chernozem, serozem) which had received known quantities of manure over a number of years were analysed for organic C and for humic acid, fulvic acid and humin, and compared with "controls" which are not described. The manured soils showed a considerable increase in humus contents over the controls in the 0-20-cm. layer, and a slight increase in the 20-40-cm. layer. Assuming that the difference in humus content was caused entirely by the added manure, it was calculated that $\frac{2}{3}$-$\frac{3}{4}$ of the added organic matter disappeared entirely—i.e. had been available as a source of nutrients for plants and micro-organisms.

Measurements of the absorption spectra of humic acids from manured and unmanured podzol and chernozem showed that there was no significant difference between the humic acid of manured and unmanured soil, but podzol humic acid differed markedly from chernozem humic acid. The humic acid from a serozem under a long weed fallow resembled that from a chernozem, and from a long-cultivated serozem that from a podzol.

[828] 631.417 : 634.9
WEINMANN, H. **Effect of indigenous trees on the nitrogen and organic matter content of the soil.** *Rhod. Agric. J.* 45, 1948 (360-361).

The stumping of natural tree-veld areas is necessary to make the best use of them as pastures. 2 paddocks were stumped in 1930 and grazed since then and 2 adjoining paddocks were left unstumped and protected. Soil samples from the stumped and unstumped areas were taken to a depth of 3 inches and examined for N, organic C and loss on ignition. The differences between the soils were very small and statistically insignificant.

[829] 631.417.1 : 632.187
KUCZAROW, W. Remarques sur le charbon de bois dans les sols du Congo. **[Remarks on wood charcoal in Congo soils.]** *C.R. Sem. Agric. Yangambi* 2, 1947 (663-669). [F.]

An estimate of the amount of charcoal obtained from a bush fire was as high as 1500 kg. per hectare. Experiments on the adsorption capacity of charcoal showed that it had the power of fixing the adsorbed elements extremely firmly as several leachings failed to release more than a minute fraction. The C/N ratio was altered by the presence

of charcoal as was also the pH. It is concluded that even if absorption by wood charcoal is not large in absolute value its presence in Congo soils is of sufficient importance to be taken into account.

[830] 631.417.2 : 537.531
RILEY, H. L. **An X-ray diffraction study of humification.** *J. Soil Sci.* 1, 1949 (104-111).

Humification is defined as the first stage of a process whereby vegetable debris is converted into peat, coal, anthracite and finally macro-crystalline graphite. Various kinds of coals, anthracites, peats, etc., give similar X-ray powder diagrams which are not unlike those of humic acids and humins.

Crystallographic structural changes occurring during carbonization of coals, etc., at different temperatures were studied by X-ray diffraction, and four different types of crystallite growth curves were recognized by plotting the dimensions of the hypothetical crystallites against carbonization temperatures. Evidence was obtained that the degree of aromatization of humic bodies increased with the proportion of carbon in them, and that base-exchange properties were determined by the number of carboxyl and phenolic groups present. The structure of humic acid (from coal) is probably cross-linked, the cross-linkage involving oxygen atoms and possibly also tilted benzene rings.

[831] 631.417.4 : 631.58
HOLLEY, K. T.; STACY, S. V.; BLEDSOE, R. P., ET AL. **Effects of cropping systems on yields and the nitrogen and organic carbon in the soil.** *Ga. Expt. Sta. Bull.* 257, 1948, pp. 20. [Ga. Expt. Sta., Experiment]

Under the regional conditions of fairly high temperature, rainfall and runoff, no system of crop and soil management has quite satisfactorily increased soil organic matter and fertility, while giving adequate returns. The wide C/N ratio of south-eastern soils is due mainly to soil-N shortage, and the effects of various cropping systems on the C and N of a sandy loam, of pH 5.1 unlimed and 5.8-6.5 limed, are reported for the second 5 years of the 10-year experiment. The systems included (1) continuous cotton, (2) continuous maize with a ploughed-in cover of Austrian peas, (3) continuous oats with a soybean cover, and (4) cotton+maize +oats in various rotations with the legumes. All crops except Austrian peas were removed from the land and the stubble was ploughed in. All plots received 600 lb./year of 6-6-4 except maize after peas, which received 600 lb. of 0-6-4. Analyses showed that the organic C remained steady or dropped slightly. The total N increased slightly, due to yearly applications of fertilizer N. The period of most rapid decomposition of organic matter could not be clearly determined. The proper utilization of green manures in systems under conditions such as obtain in these regions, where organic-matter breakdown is rapid, becomes largely a matter of timing, which is made difficult by the unpredictable weather from year to year. Cotton yields under systems (1) were similar to those under (4). For maize yields, (4) was better than (2) due to less disease in the rotated legume. With oats (4) was better than (3) due to better weed control. Liming always increased yields.

631.42 TECHNIQUE AND ANALYSIS

[832] 631.42
LEES, H. **The soil percolation technique.** *Plant and Soil* 1, 1949 (221-239). [Imp. Coll. Trop. Agric., Trinidad]

Ancillary equipment for the soil-percolation apparatus and technical details of its operation are described in full. The technique may be used to study anion and cation formation and destruction, the nitrification of NH_4 and amines and the production of CO_2 by soils.

[833] 631.42 : 535.82
BOURBEAU, G. A.; BERGER, K. C. **Thin sections of soils and friable materials prepared by impregnation with the plastic "castolite".** *Proc. Soil Sci. Soc. Amer. 1947*, 12, 1948 (409-412). [Univ. Wis., Madison]

This proprietary material, which has a low viscosity and a refractive index of 1.5591, has advantages over other materials used in making thin sections of soils. A method of preparing thin sections is described that enables the distribution of iron oxide, organic matter and crystal inclusions to be seen by plane-polarized light under a petrographic microscope.

[834] 631.42 : 539.16
HALL, N. S.; MACKENZIE, A. J. **Measurement of radioactive phosphorus.** *Proc. Soil Sci. Soc. Amer. 1947*, 12, 1948 (101-106). [N.C. Agric. Expt. Sta., and U.S.D.A., Beltsville]

The special techniques and precautions involved in field and greenhouse experiments with P^{32} are discussed. For routine analytical work Geiger-Muller counter systems are preferable to electroscopes, although the inclusion of the latter is recommended for monitoring purposes for safe working conditions. To prevent adsorption of P by the vessels the measuring equipment should be coated with dimethyldichlorosilane and the treated vessels with butyl methacrylate. The most practical method of preparing the sample for analysis is to precipitate the P, first as the molybdate and then as $MgNH_4PO_4.6H_2O$, directly on to a paper disc so that the area of the precipitate corresponds to that of the counter opening. Total P and P^{32} may then be determined on the same preparation. (See *Soils and Fert.* XI [1511]).

[835] 631.421 : 633.852.52
ROBINSON, H. F.; RIGNEY, J. A.; HARVEY, P. H. **Investigations in peanut plot technique.** *N.C. Agric. Expt. Sta. Tech. Bull.* 86, 1948, pp. 17.

The results are discussed of plot-technique studies on 2 years of peanut uniformity data. The possible value of certain incomplete-block designs in controlling soil variation are also investigated.

[836] 631.423.3
WOLF, B. **Rapid tests for major nutrients in soils and plants.** *Seabrook Farms Contr.* 1946, Jan. pp. 17. [Mimeo.]

Photocolorimetric methods previously published by the author for the determination of N, P, K, Ca and Mg in soils and plant material are described.

[837] 631.423.3 : 631.416.2
PANNETIER, G. Erreurs dans le dosage de l'acide phosphorique provoquées par l'utilisation de la méthode de Lorentz-Scheffer. **[Errors in the determination of phosphoric acid by the Lorentz-Scheffer method.]** *Chim. Anal.* 30, 1948 (15-16). Ann. Agron. 18, 1948 (208). [F.]

The Lorentz-Scheffer formol method is inaccurate even when a citric or acetic medium is used, but the principle has been retained in Terlet and Briau's method adopted by the International Association of Superphosphate Manufacturers.

[838] 631.423.3 : 631.416.2
BEATER, B. E. **A rapid method for obtaining readily soluble phosphates and phosphate fixation in soils.** *Plant and Soil* 1, 1949 (215-220). [S.A. Sugar Ass. Expt. Sta., Natal]

A technique for assessing the P status of the soil comprised the extraction of air-dry soil at 30°C. for 30 sec. by a buffer mixture of H_2SO_4 and Na borate with a pH value of 1.5. After filtering, P was estimated in the extract by the coeruleo-molybdate reaction, and a highly significant correlation coefficient was obtained for the method described and 1% citric-acid methods. A soil : extracting-solution ratio of 1 : 10 is suitable for normal soils. The P-retaining power of the soil may be obtained by shaking a sample of the soil with the extracting solution, to which a known quantity of P is added, and repeating the estimation procedure. No appreciable differences in fixation were found when the samples were shaken for 30 sec. and 30 min.

[839] 631.423.3 : 631.416.319
COPEMAN, P. R. v.d.R. **Determination of arsenic in contaminated soils.** *S. Africa Dept. Agric. Sci. Bull.* 252, 1946, pp. 5.

A modification of Greave's method [J. Amer. Chem. Soc. 25, 1913 (150)] for the determination of As in soils is described. For qualitative detection of As, a simple form of Gutzeit apparatus is satisfactory. Quantitative determination can be readily carried out by a modification of Green's method [Rept. Director Vet. Res. 1918 (541)].

[840] 631.423.3 : 631.416.4
GAPCHENKO, M. V.; SHEINTSIS, O. G. **Determination of potassium in mineral fertilizers and soils.** *Zavod. Lab.* 14, 1948 (410-413). C.A. 43 (1136).

For determination of K in mixed fertilizers, remove H_2SO_4 and P_2O_5 by shaking a 10-g. sample for 10 minutes with 400 ml. of water, filter and treat with magnesia mixture.

Filter after 10 minutes and wash with 2.5% NH_3, evaporate the filtrate to dryness, calcine to expel NH_4 salts, dissolve in water and use for analysis. For soils, extract with HCl, add NH_3 until turbid, then add 2% $MgCl_2$ solution to precipitate P_2O_5, filter, wash with hot water, evaporate the filtrate to dryness, calcine, dissolve in water and use for analysis. This method is as accurate as the chloroplatinate method.

[841] 631.423.3 : 631.811.4
LITYŃSKY, T.; ZIMNY, F. **A new electrometrical method for the determination of the lime requirement of the soil.** Repr. *C.R.M. Acad. Polon. Sci. Let.* (Cl. Sci. Math.) No. 2-3, 1948, pp. 2. [E.]

See *Soils and Fert.* XI [1095].

[842] 631.423.3 : 631.811.4
LUNDBLAD, K. Metoder för bestämning av kalkbehovet hos organogena jordar. **[Methods for estimating the lime requirment of organic soils.]** *LantbrHögsk. JordbrFörsöksanst. Medd.* 25, 1948, pp. 30. [Sw.e.]

A comparison is made between Egner's "base number", determined as the difference between the titre or a lactate extract of a soil and of the lactate extractant, and the "net lime content", i.e., the difference between the total CaO expressed in parts per thousand and the CaO that can be bound as $CaSO_4$ by the total S present in the soil. The net lime content was determined by extracting the ash of the organic soil with 6 n. HCl and determining Ca in the extract.

The relationship between the base number (x) and the net lime content (y) could be expressed by the linear equation

$$y = 1.5440 + 2.2518x,$$

with a correlation coefficient of $+ 0.9234$.

No relationship was found between either the net lime content or the base number and the pH.

To determine the lime requirement of a soil the volume weight is determined and the net lime content in a 20-cm. layer is calculated. 5000 kg./ha. is taken as the norm: soils containing less require lime; soils containing more than 6000 kg./ha. will not respond.

[843] 631.423.4
KUCZAROW, W. Observations sur le dosage de la matière organique dans les sols du Congo. **[Observations on the determination of organic matter in Congo soils.]** *C.R. Sem. Agric. Yangambi* 2, 1947 (589-593). [F.]

Mainly a discussion of Walkley and Black's method which is considered satisfactory.

[844] 631.423.7
WAEGEMANS, G. Détermination de la valeur T des sols. **[Determination of the T value of soils.]** *C.R. Sem. Agric. Yangambi* 2, 1947 (608-613). [F.]

The determination of total absorption capacity (T) as well as the degree of saturation of a soil (V) established after quantitative determination of the exchangeable bases (S) cannot be carried out except by continuous leaching. This method avoids the disadvantages inherent in agitation methods and does not involve the use of empirical mathematical formulae.

[845] 631.423.7 : 631.414.3.03
RENDIG, V. V. **Rapid determination of the base exchange capacity of soils with the flame photometer.** *Proc. Soil Sci. Soc. Amer. 1947*, 12, 1948 (449-451). [Univ. Wis., Madison]

Base-exchange-capacity determinations can be made in duplicate in 4-5 hours by saturating the soil with K by 5 treatments with neutral K acetate. Excess salt is removed by washing with water and alcohol, and the exchangeable K is extracted with a solution of NH_4 and Mg acetates, using a centrifuge. K is determined in the extract with a flame photometer.

[846] 631.423.7 : 631.437.36
PURVIS, E. R.; HANNA, W. J. **Rapid electrodialysis of soils in dilute boric acid solution.** *Soil Sci.* 67, 1949 (29-40). [N.J. Agric. Expt. Sta.]

In an investigation of the reduction of the time factor in the extraction of exchangeable cations from soil by electrodialysis a cell of the type developed by Mattson was used. The cell was constructed as a single unit, and the distance between electrodes and the thickness of the soil compartment were reduced to a minimum. A Whatman No. 2 filter paper was selected as the most efficient membrane. Exchangeable Ca, K and Na were satisfactorily extracted in 20 min., but the highly alkaline nature of the cathode

solution made the extraction of Mg impossible. Substitution of 0.05 n.H_3BO_3 for distilled water as the dialysing solution effected a more rapid replacement of the exchangeable cations by H and a satisfactory extraction of Mg. Comparison of the exchangeable cations of eight soils as determined by extraction with neutral n.NH_4 acetate and by electrodialysis for 20 min. with 0.05 n.H_3BO_3 showed close agreement between the two methods except in the case of Na, which was extracted in greater quantities by electrodialysis than by NH_4 acetate. Anode and cathode solutions were combined for the photometric determination of Ca, K and Na and the colorimetric determination of Mg. The method has possibilities in the determination of available-P content.

[847] 631.425.22
MOMIN, A. U. **A new simple method of estimating the moisture content of soil *in situ*.** *Indian J. Agric. Sci.* 17, 1947 (81-85). [Met. Off., Poona]

A simplification of the thermal conductivity method of Byron, Shaw and Baver is described. The bulb of a long-stemmed thermometer was wound with a heating element which, after insulating, was connected through a variable resistance, an ammeter and a switch to a 6-volt storage battery or a large-capacity dry-cell battery. A fixed current, e.g. of 0.3 amp. was passed through the instrument, and the time required to raise the temperature of the bulb by 5°C. was recorded. The instrument and the soil surrounding the bulb should not be disturbed and a constant current must be used. The main disadvantages of the method are that variations in the packing of the soil particles affect the readings and that calibration of the instrument is a lengthy process which must be carried out where the instrument is installed. Accuracy is comparable with that of the drying and weighing method.

]848] 631.425.4
TIULIN, A. F. **[Method of separating coarse silt into aggregated and non-aggregated particles and evaluating the two fundamental forms of aggregation of silt.]** *Pochvovedenie* 1948 (421-428). C.A. 43 (793). [R.]

For particles of silt, 0.01-0.05 mm. is the limit above which there is no aggregation. The quantity of silt aggregated depends on the quantity of colloids in the soil. In a virgin podzol profile 70-80% of the silt is not aggregated, and aggregation increases with cultivation. Methods are given for the separation of aggregated and non-aggregated silt.

[849] 631.425.6 : 631.425.22
KØIE, M. **A portable alternating current bridge and its use for micro-climatic temperature and humidity measurements.** *J. Ecol.* 36, 1948 (269-281). [Univ. Copenhagen]

The apparatus described may be used for measuring air and surface temperatures with an accuracy of 0.1°C. and is suitable for use in soils. The measuring bridge may be used with a Bouyoucos gypsum block for soil-moisture measurements as well as with the resistance hygrometer for R.H. determinations.

[850] 631.425.66 : 631.414.2
CAILLÈRE, S.; HÉNIN, S. Sur la signification des résultats de l'analyse thermique différentielle. **[On the significance of results of differential thermal analysis].** *Verre Silicates Indust.* 13, 1948 (114-118). [F.]

The endothermic inflexion temperatures, i.e., those at which water of constitution is lost, are discussed for aluminous, ferruginеous and magnesian minerals. It is concluded that these temperatures depend on the chemical nature of the mineral and on a factor thought to be of a mechanical nature that is connected with the compactness of the lattice. It is now established in the case of silicates that exothermic phenomena are indicative of neocrystallization and therefore will be dominated by the nature of the chemical elements concerned. This is demonstrated by an examination of the chemical formulae, the temperatures at which exothermic phenomena occur and the neo-formation products in the cases of kaolinite, montmorillonite, sepiolite and antigorite. When a mineral is heated it first loses its OH groups. As water is lost either fresh crystalline substances may form or the dehydrated mineral may exist in an amorphous state. The delay in crystallization may be due to a greater stability of certain

elements in the lattice, e.g., the Si_2O_5 system. In this case, neocrystallization would only occur when the temperature was sufficiently high to disrupt the original bonds. A second hypothesis envisages total amorphization of the mineral and the prevention of re-crystallization by impurities. These hypotheses are discussed with reference to the behaviour of α- and β-antigorite.

It is suggested that the endo- and exothermic inflexions registered in the course of thermal analysis indicate not the amount of heat accompanying a phenomenon, but a calorific balance depending on the conditions of transformation.

[851] 631.427.3

ANHALTISCHE VERSUCHSSTATION, BERNBURG. Untersuchungen zur Tripelanalyse, einer neuen Methode zur Bestimmung des Düngebedürfnisses. **[Investigations of triple analysis, a new method of determining fertilizer requirements.]** *Ztschr. Pflanz. Düng.* 37, 1946 (232-244). [G.]

In Lundegårdh's triple-analysis method, leaves are taken during the period from the start of earing to the start of fruiting, are ashed and analysed for N, P and K. The applicability of the method was tested in experiments with 2 winter and 2 summer cereals and potatoes on plots whose fertilizer treatments had been uniform for 13-33 years. Ca and Mg leaf contents were also determined and also yields, P and K contents of the straw and the Neubauer values for P_2O_5 and K_2O.

In general, the nutrient level of the leaves reflected the nutrient supply, but not in all cases. The differences in leaf values are to some extent so small, even with considerable differences in yield, that the effects of the fertilizing cannot be referred to them. Plant species and stage of development had much more effect on the leaf level than Lundegårdh assumed, and the period allowed for sampling appeared too long, as migration of nutrients from the leaves began very soon after the start of flowering.

[852] 631.427.3 : 631.547.2

ROUSSOPOULOS, N. C. Sur la loi du rendement en chimie agricole. **[The yield law and agricultural chemistry.]** *Ann. Agron.* 18, 1948 (145-166). [F.]

A discussion of the consistence of Mitscherlich's approximations and the Baule-Mitscherlich formula on the one hand with the laws of restitution, non-proportional yield, limit of yield, Wolff's law and Liebig's law of the minimum as modified by Liebscher on the other hand. A satisfactory substitute for Mitscherlich's second approximation is presented, with an experimental verification.

[853] 631.427.3 : 633.16

GOODALL, D. W. **Studies in the diagnosis of mineral deficiency. IV. The mineral content of barley plants in relation to potassium deficiency.** *Ann. Appl. Biol.* 35, 1948 (605-623). [Imp. Coll. Sci. Tech., London and E. Malling Res. Sta.]

Material from 4 fertilizer trials on barley was analysed for the purpose of comparing the extent to which the K content of different plant organs was diagnostic of K deficiency. Differences in composition between plants from different sites were proportionately greater in the older leaf blades than in other organs for Ca, in young leaves for Mn and Na and in older leaf blades and sheaths for K. Differences in Na and Mn content at different sites were related to differences in K status. Applications of muriate of potash increased the K content of all the organs except the ears and decreased the content of Mg, Mn and Na and of Fe at one site. The effect of K supply on Mn and Na content was most marked in young leaves. The proportional increases in K content as a result of the application of muriate of potash were similar at all 4 sites, although responses in growth and yield differed greatly. Responses to muriate of potash observed in grain yields are significantly correlated with the K content of the older leaf blades and stems and the following tentative limiting values at the time of ear emergence are suggested, above which no increase in grain yield as a result of K manuring may be expected: (a) 0.92% of K in dry matter in the older leaf blades, (b) 1.01% of K in dry matter in stems.

631.43 SOIL PHYSICS

(*See also* Abs. No. 914)

[854] 631.43 : 525.5

ROWLES, W. **Physical properties related to structure of Ste. Rosalie clay and their seasonal variation.** *Sci. Agric.* 28, 1948 (558-573).

The moisture content of the soil varied considerably at the various sampling dates during the summer. As the soil became drier the total pore space increased and the non-capillary pore space increased relatively more than the total pore space. Micro-aggregation increased slightly but steadily during the summer, the maximum percentage of aggregation occurring in the September sampling. Non-capillary porosity and therefore permeability were influenced to about the same extent by texture, moisture and the content of organic matter in the type of soil under investigation.

[855] 631.432 : 634.9
HOOVER, M. D. **Effect of removal of forest vegetation upon water-yields.** *Trans. Amer. Geophys. Un. 1944*, 25, 1945 (969-977). For. Abs. 10 (19-20).

The water yields before and after removal of an indigenous, mixed deciduous forest were compared. The soil of the experimental area had an exceptionally high infiltration capacity and a structure favourable to water storage. Results so far indicate that in this locality a forest stand with an understorey of dense shrubs transpires 17-22 inches of water annually. Removal of this vegetation increased streamflow by an amount equal to the estimated transpiration when sprout growth was prevented, the largest increases occurring during autumn and during periods of heavy rain in the growing season. In late winter and early spring, run-off was little affected.

[856] 631.432.2 : 549.623.59
ROSEN, A. **Vermiculite conserves soil moisture.** *Farm. Week. S. Africa* 76, Dec. 29, 1948 (42-43).

Vermiculite is a mica occurring in northern Transvaal and possessing high moisture content between the laminations. On heating it becomes converted into light, sterile, granular particles containing air spaces capable of absorbing and retaining many times their own weight of water. Seedlings grown in vermiculite can be removed easily without injury. It lightens heavy soils and increases moisture retention in sandy soils and chemical fertilizers added to it are readily assimilable by plants.

[857] 631.432.2 : 581.116
PENMAN, H. L. **The dependence of transpiration on weather and soil conditions.** *J. Soil Sci.* 1, 1949 (74-89). [Rothamsted]

The evaporation from an open-water surface can be estimatedfrom wea ther data; the ratio of the transpiration from plentifully watered turf to the evaporation from similarly exposed open water is known as a function of time of year. These results of earlier work are restated and used as a basis for estimating transpiration rates when optimum water supply is not maintained. It is assumed that the roots occupy a depth of soil which will yield a definite amount of water at maximum rate. After this amount is transpired the rate is limited by the ability of the lower soil to transmit water, and on the basis of earlier experimental work a composite drying curve is drawn up. With this curve and the relevant weather data it is possible to estimate the seasonal changes in the moisture content of soil under turf. It is shown that the times of the running of the field drains at Cambridge University Farm can be predicted using only one arbitrary constant—the available water in the root zone—which varies from year to year with the spring rainfall. No other collection of records is as satisfactory for testing purposes, but applications to drain-gauge records from Craibstone (Aberdeen), Harrogate, Compton, and Farlington have given generally satisfactory results. The survey shows the great desirability of wider studies of root development as affected by soil type and depth, fertilizer treatment and weather conditions.—Author's summary.

[858] 631.433.1 : 631.432.2
HARDY, F.; DERRAUGH, L. F. **The water and air relations of some Trinidad sugar-cane soils. Part II.** *Trop. Agric. Trin.* 24, 1947 (111-121). [I.C.T.A. Trinidad]

The characteristics of rainfall over the area are described. It is estimated that 60% of the total annual rainfall is lost by evaporation, leaving about 31 inches for penetration and run-off. Soil-moisture constants were measured so that calculations could be made of the theoretical depths of penetration of soaking rains into sandy and clayey soils or, alternatively, of the amounts of rain required to raise the soil-moisture status from wilting

point to field capacity and to saturation capacity. The results indicate that, for evenly-spaced showers, saturation and run-off are seldom likely to occur provided surface-soil structure is unimpaired and infiltrability remains high. In actual practice, during long and intense rainfall, run-off and erosion may occur over highly-cambered beds.

Available soil-moisture data for sandy and clayey soils were compared with total effective rainfall corrected for torrential showers. The comparison shows considerable discrepancies, but it is suggested that "effective-rainfall" graphs give a sufficiently exact picture of the moisture conditions in the soil to warrant their use for comparing annual-rainfall regimes. Results of the investigation suggest that wet years are more conducive to high sugar-cane yields than are dry years and that there may be a real danger in over-draining the soil by constructing beds that are narrow and highly cambered. One of the main objects of tillage should be to induce rain-water to enter the soil and so become "effective" in producing a crop.

[859] 631.434

FREI, E. Gefügeuntersuchungen an landwirtschaftlichen Kulturböden. **[Studies of soil fabric in agricultural soils.]** *Landw. Jahrb. Schweiz* **62**, 1948 (20-36). [G.f.]

Five types of soil fabric (structure + texture) are distinguished: (1) the primitive type, in which the individual particles form no aggregates, (2) chlamydomorphic, in which each particle is surrounded by a colloidal coating usually uniting them into fragile complexes, (3) fine-aggregate, of aggregate diameter < 0.2 mm., (4) crumb, > 0.2 mm. and (5) sponge, in which crumbs are aggregated. Each type has cohesive and loose forms.

Studies are described of the effect on the fabric of loose to weakly cohesive soils of (a) earthworms, (b) saturation with Na, K, Ca and NH_4 as the chlorides or with ammonium phospate and (c) organic matter. With earthworms, a soil of loose-crumb fabric was quickly transformed to a cohesive sponge type. Increase in Ca saturation increased permeability, fabric and crumb stability and decreased the cohesion. Na increased cohesion. PO_4 hindered the removal of Ca ion and favoured fabric stability. Peat and lignin in 6 months transformed a sponge type into a loose-crumb type, with a tendency towards the formation of a primitive fabric. Farmyard and green manure increased cohesion, and favoured the production of the sponge type.

[860] 631.434 : 633.2.03

PETRUSHENKO, V. Z. **[The influence of a mixed sward of perennial herbage on soil structure under the conditions of the Ukrainian steppe.]** *Pochvovedenie* 1949 (42-48). [R.]

Comparison were made of the yield of hay, weight of roots, and contents in the soil of humus and aggregates after 1, 2 and 3 years of pure stands of lucerne and *Agropyron* and a mixture of the two. The soil was a southern chernozem. In every case the mixture was superior to the pure stands, root growth in particular being greater. This resulted in a slightly higher humus content in the soil under the mixture as well as a slight, but scarcely significant, increase in aggregate content.

[861] 631.436 : 551.578.4

SHULGIN, A. M. **[The improvement of soil climate in the Altai region.]** *Pochvovedenie* 1949 (54-56). [R.]

In the very harsh climate of this part of Western Siberia where temperatures of -40°C. in early winter and strong winds are common, a definite relationship was established between the depth of the snow cover, the soil temperature and the frost damage to winter crops and grass; the greater the snow cover, the warmer the soil and the less the damage. Most of the snow falls in the first half of the winter. It is thought that great improvements in general conditions of growth and in soil structure and fertility could be made by measures that would ensure the maximum accumulation of snow and its even distribution over the fields.

631.44 SOIL TYPES

(*See also* Abs. Nos. 798, 1066)

[862] 631.44 : 551.41

GLENTWORTH, R.; DION, H. G. **The association or hydrologic sequence in certain soils of northeast Scotland.** *J. Soil Sci.* 1, 1949 (35-49). [Macaulay Inst., Aberdeen]

The *association* is a group of soils (*associates*) developed on the same parent material within one climatic area and differing in drainage conditions. A complete association has excessively drained, well drained and poorly drained associates, related through their hydrologic sequence. It is suggested that the soil climatic zone is characterized better by the complete range of hydrologic types in the association than merely by the well drained, so-called "normal" soil. Variations in important soil properties—e.g. N, P, R_2O_3 content, R_2O_3 translocation, pH, exchangeable Ca, base saturation and base-exchange capacity—follow definite trends throughout the hydrologic sequence of an association, irrespective of the parent material.

[863] 631.44 : 631.471
THORP, J. **Practical problems of soil taxonomy and soil mapping in Great Plains States.** *Proc. Soil Sci. Soc. Amer. 1947*, 12, 1948 (445-448). [U.S.D.A., Beltsville, Md.]

Descriptions are given of several soil associations which are difficult to map on the conventional soil-type basis. In mapping it is sometimes necessary to include associated soil types in the areas mapped as occupied by one type, i.e., many mapped soil types are catenary or non-catenary complexes. Increasing use should be made of such complexes as mapping units, and the report accompanying the map should contain descriptions of the component types and estimates of the proportions in which the types occur. It is suggested that a soil-type name should be used as a mapping unit when one type comprises at least 85% of the total area, but in such cases the included minor soils should also be described.

[864] 631.445.11 : 631.48
ZEUNER, F. E. **Frost soils on Mount Kenya, and the relation of frost soils to aeolian deposits.** *J. Soil Sci.* 1, 1949 (20-30).

Stone "nets" and "stripes" occurring at altitudes of 13-14,000 ft. are described. These differ from corresponding structure soils found in arctic regions in that they are not associated with either a permanently frozen subsoil or an impermeable rock surface. They appear to be formed mainly or entirely by frost heave produced by needle-ice formation and to be associated with daily rather than seasonal freezing. Mechanical analyses show that the frost soils contain practically no particles smaller than the fraction of 0.01-0.002 mm., which is taken to be the lower limit of comminution by frost weathering. The Mount Kenya frost soils consist predominantly of the fraction 0.01-0.1 mm., and this is taken as evidence of their immaturity.

It is shown that the fine earth of wind-borne loess has the same particle grading as that of frost soils, but for different and unconnected reasons. This coincidence, however, explains why enormous loess deposits border formerly glaciated areas in the northern hemisphere; frost weathering prepared enormous quantities of material easily transported by wind.

[865] 631.445.11 : 778.35
CABOT DUAL, E. C. **The Northern Alaskan coastal plain interpretated from aerial photographs.** *Geog. Rev.* 1947 (639). Ann. Géog. 57 (377).

The polygonal-soils zones of northern Alaska are described as shown by aerial photographs.

[866] 631.445.2 : 631.48
DEB, B. C. **The movement and precipitation of iron oxides in podzol soils.** *J. Soil Sci.* 1, 1949 (112-122). [Rothamsted]

In experiments *in vitro* on the mutual coagulation and peptization of iron-oxide sols and water-soluble peat, water-soluble fen and alkali-soluble, water-soluble and acid-soluble humus sols, the amounts of humus required to peptize iron-oxide sol varied considerably with the form of humus and the concentration and pH of the iron-oxide sol. At pH 4.0 and with an iron-oxide concentration of 100 p.p.m. (more than is found in a podzol soil solution) full peptization was obtained with an amount of humus equal to about one-third the amount of iron oxide. In podzols there is always more humus than sesquioxides, and any iron-oxide sol formed by weathering could, therefore, be fully peptized and washed downwards by humus in the soil solution.

No evidence was obtained that precipitation of Fe from humus-protected sols in the B horizon was effected by exchangeable Ca,

nor that any purely chemical property of the B horizon would effect the adsorption of Fe from complex organic salts. It is suggested that the precipitation of Fe in the B horizon may be a biological process.

[867] 631.445.4/5
LARSON, W. E.; ALLAWAY, W. H.; RHOADES, H. F. **Characteristics of three soils from the chernozem and chestnut soil regions of Nebraska.** *Proc. Soil Sci. Soc. Amer. 1947*, 12, 1948 (420-423).

[868] 631.445.4 : 631.81
TIULIN, V. A. [**The efficiency of fertilizers on ordinary chernozem soils of the Stone Steppe.**] *Sovet. Agron. No.* 12, 1948 (61-73). [R.]

The efficiency of fertilizers was considerably increased by the presence of windbreaks, more moisture being accumulated in the soil in the vicinity of windbreaks than in the open steppe, thereby increasing the yields of wheat and sugar beet.

[869] 631.445.6 : 631.48
CHARLES, G. Sur le phénomène de rubéfaction et ses conditions climatiques. [**On the phenomenon of rubefaction and its climatic conditions.**] *C.R.* 228, 1949 (589-591). [F.]

The red Mediterranean soils are usually looked upon as fossil formations laid down under a hot, moist climate. Although it is generally admitted that Algerian climatic conditions are no longer favourable, this hypothesis is supported by the occurrence of rubefaction on bare rocks exposed during excavations two years ago and on the rough-casting and mortar of numerous walls in Algiers. In the former instance a red sandy soil was formed and in the latter, a red clay. Rubefaction does not occur under the direct action of rain, but only at points which remain moist after storms and when the temperature has risen sufficiently. Mosses are important factors as they retain moisture. If either the temperature or the moisture is insufficient the yellow soils occurring in many parts of Algeria are formed.

[870] 631.445.7 : 631.51
BRACONNIER, C. Le maintien de la structure du sol. dans les terres de grandes cultures. [**Maintenance of soil structure in plantation-crop soils.**] *C.R. Sem. Agric. Yangambi* 1, 1947 (97-103).

Congo soils are chemically poor, but have a very good natural physical structure which tends to deteriorate when the natural vegetation is destroyed. It is most important to preserve soil structure as far as possible when land is cleared. Plantations should therefore be prepared without burning the forest growth. In some cases after the trees have been felled *Hevea* is planted among the undergrowth. After felling, forest plants produce a vigorous growth between the lines of *Hevea* and are cut regularly by rough slashing. After a few years the vegetation changes, and scything has to be carried out at infrequent intervals in order to encourage the new type of ground cover. The loppings should be spread along the line.

[871] 631.445.73
CHEVALIER, A. [**Degradation and conservation of soil of tropical Africa: origin and extension of laterites and of ferruginous shell: struggle against sterilization of African soil.**] *Rev. Int. Bot. Appl.* 28, 1948 (49-66). B.A.BIII, 1948 (413).

Tropical African soils are mainly lateritic and may be young, mature or degraded. The formation of a laterite layer requires heavy rainfall alternating with hot dry seasons. In extreme instances laterite loses all its vegetation, and the mineral components Fe and Al but not SiO_2 lie at the surface forming the ferruginous shell in which all cultivation is impossible. The mechanism of laterite formation is discussed.

[872] 631.445.73
WAEGEMANS, G. Latéritisation et latérites. [**Lateritization and laterites.**] *Centr. Colon. Coord. Rech. Chim. Pub.* 1948, pp. 12. [F.] [Lab. Rech. Chim. Tervuren]

The various definitions of laterite are discussed and shown to be incomplete in the light of recent work on the chemistry and mineralogy of clays. It is proposed that the term *lateritization* should be used to designate those processes in which $Fe(OH)_3$, Al_2O_3 and secondary SiO_2, rather than neogenic silicate minerals, are formed. The term *laterite* should be applied to all oxides of Fe, Al and Si of secondary origin.

[873] 631.445.73

THORP, J.; REED, E. C. **Is there laterite in rocks of the Dakota group?** *Science* 109, 1949 (69). [U.S.D.A., Lincoln, Neb.]

Hard, cellular, slaglike "ironstone", ranging in colour from red to yellowish brown and dark brown and overlying reticulately-mottled red and light grey kaolinite clay beds of the Dakota group have close similarity to the laterite of Buchanan. The Dakota group includes more than one horizon that contains material essentially like Buchanan's laterite. This material probably represents a former subsoil horizon of an ancient soil which was essentially like Marbut's groundwater-laterite soils, described in the Amazon Valley and was formed during periods when subsoil water fluctuated seasonally in what is now a cellular ironstone. Groundwater-laterite soils, with subsoil horizons of laterite, occur most extensively at present under tropical climates with fluctuating, high water table or with periodic seepage, and climates with alternating wet and dry seasons are especially favourable for their formation. Present knowledge suggests that a long time is required for the formation of these soils.

631.452/8 FERTILITY. TOXICITY. EXHAUSTION

(*See also* Abs. Nos. 831, 1136)

[874] 631.452 : 312

BENNETT, M. K. **Population and food supply: the current scare.** *Sci. Mo.* 68, 1949 (17-26).

Evidence is adduced that although in the last 50 years world population has increased by 750 million the general standard of nutrition has tended to rise, or at worst has remained constant. In all western countries for which data are available the proportion of the diet derived from cereals and potatoes has decreased, and in many countries there has been a slight decrease in calorie intake due, presumably, to a decline in the amount of physical work done. There is no direct evidence that the relatively low standard of nutrition in the Orient, where population increases have been greatest, has declined further. At the same time yields of wheat increased by 25% while the acreage increased by 10%. Only over an insignificant area has the maximum theoretical (economic) productivity of the land been attained—i.e., the productivity attainable under optimum application of labour, capital and management. The maximum physical productivity would be much greater. It is believed that the economic impediments (many of which would be removed if the demand for food increased more rapidly than the supply) to attaining maximum productivity far outweigh in their influence on food supplies such factors as soil erosion and loss of soil fertility.

[875] 631.452 : 631.414.3

WYND, F. L.; STEINBAUER, G. P. **Correlations between soil properties and pasture productivity.** *Lloydia* 11, 1948 (171-180). [Mich. St. Coll.]

An attempt was made to correlate the soil properties of five natural and two highly improved pastures and their productivity as rated by experienced cattlemen. Organic-matter content and base-exchange capacities were positively related to productivity, except in one improved pasture where the base-exchange capacity was as low as in the poorest pasture. This suggests that, under natural conditions, the base-exchange capacity is associated with factors such as replaceable bases or N, more intrinsically important than the base-exchange capacity itself. Although there was a strong correlation between total N and productivity of the natural soils the improved soils contained only the same amount of N as the poorest soils in the vicinity. The very close relationship between productivity and the amount of total replaceable bases, especially of Ca and Mg, in all the soils suggests that the improvement was probably due to the increase in the amount of total replaceable bases. The highly productive soils had higher pH values and P contents than those of poorer pastures.

[876] 631.453 : 546.16

BOWLER, R. G.; BUCKELL, M.; DRUETT, H. A. ET AL. **Studies of the contamination produced in the Fort William area by fluorine compounds.** *M.R.C. Mem.* 22, 1949 (1-31).

The concentration of F in the soil of the countryside surrounding the Al factory at Fort William, Scotland, was surveyed. In general the F concentration decreased with distance from the factory and was higher along

the main wind directions. An area of peat exposed by the lack of vegetation coincided with a high F concentration in the soil. Seven miles N.E. of the factory the F concentration was more than four times the value for normal control samples—8 and 13 p.p.m., dry weight—whilst it dropped to the control level within three miles of the factory in a N.W. direction. Analyses of samples taken at different depths showed that F is not rapidly fixed in the top layers.

[877] 631.458 : 633.51
LECOMTE, M. Culture cotonnière et conservation du sol. [**Cotton cultivation and soil conservation.**] *C.R. Sem. Agric., Yangambi* 1947 (65-74). [F.] [I.N.E.A.C., Bambesa]

The Bambesa station offers a typical example of soil degradation by cotton, although a correct rotation according to European standards has been applied since 1922. The system of rotating cotton with a short leguminous fallow has failed. Measures for soil protection are discussed in relation to savanna and forest country.

631.459 SOIL EROSION

(*See also* Abs. Nos. 1082, 1116, 1125, 1132, 1154)

[878] 631.459 : 551.55
ZINGG, A. W. **A study of the movement of surface wind.** *Agric. Engng.* 30, 1949 (11-13, 19).

Methods of approach to the analysis of records of wind movement are presented with a view to obtaining a better understanding of the characteristics of the natural force encountered in soil erosion by wind. Results of the study of wind velocity, wind intensity-duration curves, and the pattern of windstorms indicate that the problem of wind erosion may be approached analytically by methods similar to those used in hydrology and flood control.

[879] 631.459 : 551.577
EKERN, P. C., JR.; MUCKENHIRN, R. J. **Water drop impact as a force in transporting sand.** *Proc. Soil Sci. Soc. Amer. 1947*, 12, 1948 (441-444). [Wisconsin Agric. Expt. Sta., Madison]

An apparatus for the simulation of rain is described. Drop diameter was controlled by using a series of glass tubes of various diameters selected according to the interrelation of tip diameter and size of pendant drop formed. Drop diameter was varied from 2.75 to 5.8 mm. The drops were allowed to fall 35 feet to reach more than 95% of their terminal velocity. Intensities of precipitation were established by rate of viscous flow of water through hypodermic needles. A standard sand was exposed to drop impact for 5 minutes. Determination was made of the total amount of sand transported and of the amount transported downslope from a $\frac{1}{8}$-sq.ft. target whose surface was set at slopes ranging from 0 to 36%.

At constant drop size and time, the amount of sand transport was directly proportional to the intensity of precipitation. This allowed calculation of data to a basic reference intensity of 1 inch per hour. An equation was derived for the relation between percentage slope and the fraction moved downslope, viz.:—

% transported downslope=50+.94 slope %.

A second equation was developed for the relation of drop diameter (in mm.) to amount (in tons per acre) transported in a 5-minute period at an intensity of 1 inch per hour, viz.:—

Transport=9.52 log diam. —2.73

According to these equations a rainfall of 4 inches per hour would splash 7 tons of sand per acre in 5 minutes.—Authors' abstract.

[880] 631.459 : 631.582
HAYS, O. E.; BAY, C. E.; HULL, H. H. **Increasing production on an eroded loess-derived soil.** *J. Amer. Soc. Agron.* 40, 1948 (1061-1069).

A good 5-year rotation, including 3 years of lucerne-brome hay and a liberal application of fertilizer, adds sufficient N and organic matter greatly to increase the productivity of a severely eroded soil.

[881] 631.459 : 631.61

COLLEAUX, L. La lutte contre la dégradation des terres en territoire de Kabare. [**Control of the degradation of soil in the Kabare territory.**] *C.R. Sem. Agric. Yangambi* 1, 1947 (266-289). [F.]

The two principal causes of soil degradation in this territory are overcropping and overstocking. The establishment of horizontal hedges as an anti-erosive measure, guard ditches and ditches along the hedges to strengthen their anti-erosive effect are part of the programme for erosion control. Other measures are rotation of crops and strip cropping. The improvement of native agriculture is based on the establishment of banana plantations along the anti-erosion terraces. Banana fallows cover the ground well and are easier to keep up than leguminous fallows.

[882] 631.459 : 631.61

QUARRÉ, P. Contribution a l'étude du problème de l'érosion. [**Contribution to the study of the erosion problem.**] *C.R. Sem. Agric. Yangambi* 1, 1947 (255-262). [F.]

Suggested measures for erosion control during the early stages are straightening gullies where these are not more than 70 to 80 cm. in depth and sited on a rocky foundation. This should be followed by planting the sides with *Cynodon* spp. Other methods are suggested for ravines up to 3 m. in depth. Control of grazing and of movements of cattle is also necessary.

[883] 631.459 : 633.262

STEWART, G.; HULL, A. C. **Cheatgrass (*Bromus tectorum* L.)—an ecologic intruder in southern Idaho.** *Ecology* 30, 1949 (58-74). [U.S. For. Serv., Ogden, Utah]

The status of cheatgrass in the western U.S. is reviewed. The grass thrives mainly where the native plant cover has been injured, and helps in soil protection and erosion control on poor soils. Where neither burned nor heavily grazed for several years cheatgrass accumulates a considerable amount of litter which adds to the soil organic matter, increases infiltration and protects the soil against the impact of rain. The presence of cheatgrass greatly increases fire hazards. Eradication measures include ploughing, heavy discing or some type of thorough cultivation in late spring or after autumn germination.

631.46 SOIL MICROBIOLOGY

(*See also* Abs. Nos. 941, 978, 1061)

[884] 631.461 : 581.144.2

WALLACE, R. H.; LOCHHEAD, A. G. **Qualitative studies of soil micro-organisms : VIII. Influence of various crop plants on the nutritional groups of soil bacteria.** *Soil Sci.* 67, 1949 (63-69). [Dept. Agric., Ottawa]

Wheat, oats, red clover, timothy, lucerne and flax were grown in pots, and the bacteria of the rhizospheres at the seedling and flowering stages and from uncropped soil were isolated. The bacteria were divided into groups requiring: I, simple nutrients ; II, amino acids ; III, growth factors ; IV, amino acids plus growth factors ; V, yeast extract ; VI, soil extract, and VII, yeast and soil extracts. The rhizosphere contained a larger proportion of group-I bacteria than did the uncropped soil. An analysis of variance showed the legumes to have a greater effect than the Gramineae, that differed from that of flax only in groups II and IV. The increase of organisms in the rhizospheres of wheat and lucerne, lucerne and flax, red clover and flax, wheat, and red clover and timothy increased during growth with respect to II, III, IV, VI and VII respectively. Effects of wheat and timothy decreased for IV and VI respectively.

[885] 631.461 : 631.432.4

BHAUMIK, H. D. **Soil moisture tension and microbiological activity.** Abs. in *Iowa St. Coll. J. Sci.* 23, 1948 (13-15).

Microbiological analyses by cultural methods showed differences in the abundance of microbial groups, both at differing moisture tensions within the same soil and in different soils maintained at the same moisture tension. It is believed that differences in microbial populations in soils are partly responsible for differences in the cumulative amounts of CO_2 evolved from the soils. Pure-culture studies in steam-sterilized silt loam showed that the activity of fungi, as shown by CO_2 evolution, remained fairly constant within the range of moisture tensions used. CO_2 production by bacteria and actinomyces was greatly depressed with increase in moisture tension. Microbial populations were greater in the drier soils.

[886] 631.461 : 631.51
DAWSON, R. C.; DAWSON, V. T.; MCCALLA, T. M. **Distribution of microorganisms in the soil as affected by plowing and subtilling crop residues.** *Neb. Agric. Expt. Sta. Res. Bull.* 155, 1948, pp. 26. Biol. Abs. 22 (2509).

When crop residues decompose on the soil surface, greater numbers of aerobic micro-organisms develop in the top inch of soil than when such residues are ploughed under. In 12 comparisons at intervals of 5 days to 14 months, no significant difference in number of micro-organisms was found in the top 6 inches of soil when subtillage and ploughing of residues were compared.

[887] 631.461.1/3 : 631.416.1
BROADBENT, F. E. **Some factors affecting nitrogen transformations and organic matter decomposition in soils.** Abs. in *Iowa St. Coll. J. Sci.* 23, 1948 (16-17).

A net loss in organic matter may occur in the decomposition of highly-available-energy materials such as sucrose in soils, and under some conditions green manure may decrease soil organic matter. Experiments, in some of which N_{15} was used as a tracer, showed that most N released after the addition of plant residues to the soil is derived from the soil rather than from the added residues. N release seemed to depend to some extent on the intensity of microbial activity which involves loss of C and reduction of the C/N ratio. In an experiment with Sudan grass enriched with C^{13} and N^{15}, N release from soil organic matter was accelerated to a greater extent than was decomposition of organic matter as a whole. It is possible that a large part of the N supplied to succeeding crops by green manures originates in the supposedly stable soil organic matter rather than in fresh plant residues. The relative rates of decomposition of plant matter in the soil were inversely related to the quantity added. It is suggested that the activity of the microbial population that develops after the incorporation of crop residues is limited by the space available for the development of microbial cells as well as by the availability of materials.

Small amounts of organic matter decompose more rapidly than larger quantities and infrequent large applications of organic residues may build up and maintain the organic-matter level better than would frequent small applications.

The rate of decomposition is a function of the partial pressure of oxygen. N release from added residues was greatest at the lowest oxygen percentage, but the proportion of nitrate in the N released was greater at the higher oxygen percentages.

[888] 631.461.3
KALINENKO, V. O. [**Heterotropic bacteria as nitrifiers.**] *Pochvovedenie* 1948 (357-363). C.A. 43 (1458). [R.]

Many heterotropic bacteria were isolated from sea water, sewage and soil and grown on organic media. Some of the organisms were capable of nitrifying organic and inorganic N into nitrates, and, under other conditions, the same organism could reduce combined N to gaseous N.

[889] 631.466.1
KHALABUDA, T. V. [**Results of soil microfloral surveys.**] *Microbiologia* 17, 1948 (257-268). C.A. 43 (1512).

Spring and autumn counts of fungi were made at three depths in 10 Kiev soils with a pH range of 5.2-7.0. Results in thousands per g. were: 4-5 cm., 190-493, 250-570; 20-25 cm., 15-110, 18-113; 50 cm., 0-63, 0-50, in spring and autumn respectively. Species populations as well as total counts fluctuated widely with soil type, vegetation and cultivation. *Penicillium* spp. accounted for 50-60% of the observed species, with *Mucor, Fusarium, Trichoderma* and *Cladosporium* next in abundance. Many fungi showed a high degree of cellulolytic and saprophytic activity, but only low or medium proteolytic activity.

[890] 631.466.1 : 577.15
LINDEBERG, G. **On the occurrence of polyphenol oxidases in soil-inhabiting basidiomycetes.** *Physiol. Plant.* 1, 1948 (196-205). [Univ. Uppsala]

Pure cultures of litter-decomposing and mycorrhizal basidiomycetes were grown partly on agar containing glucose, malt extract and salt and partly on the basic agar medium plus gallic or tannic acid. The polyphenols tended to inhibit fungal growth. The production of a polyphenol oxidase, indicated by the presence of a brown diffusion zone around the mycelia, occurred regularly with

the litter-decomposing, but not with the mycorrhizal fungi. No distinct boundary however, could be drawn between the two groups; *Boletus subtomentosus* appeared to be transitional while *Lactarius deliciosus*, a mycorrhizal fungus, gave a strong polyphenol-oxidase reaction.

[891] 631.466.2 : 576.809.7
LANDERKIN, G. B.; LOCHHEAD, A. G. **A comparative study of the activity of fifty antibiotic actinomycetes against a variety of soil bacteria.** *Canad. J. Res.* 26C, 1948 (501-506). [Dept. Agric., Ottawa]

The antagonistic effects of 50 soil actinomycetes, isolated on the basis of their antibiosis to *E. coli*, were tested upon a series of soil organisms by the flood plate technique. Only one culture medium was used for each test organism. *Corynebacterium sepedonicum* was the most susceptible organism, followed by *Bact. globiforme, Actinomyces scabies, Rhizobium trifolii, E. coli, R. meliloti, Erwinia carotovora, Azotobacter vinelandii, A. chroococcum, Xanthomonas phaseoli, X. campestris* and *R. japonicum* in decreasing order. The degree of inhibition did not follow this order, for example, the inhibition zones of *R. japonicum* were relatively large. In general, those actinomycetes with the most intense activity acted on the greatest number of bacterial species.

[892] 631.466.2 : 576.809.7 : 632.4
LOCHHEAD, A. G.; LANDERKIN, G. B. **Aspects of antagonisms between micro-organisms in soil.** *Plant and Soil* 1, 1949 (271-276). [Dept. Agric., Ottawa]

A previous investigation had shown that the incorporation of soybean cover crops reduced the incidence of potato scab. Actinomycetes were isolated from the rhizospheres of potatoes in soybean-treated and control soils, and tested by the spot inoculation method for antibiosis against *Micrococcus pyogenes, Escherichia coli* and *Streptomyces scabies*. The incidence of actinomyces antagonistic to *S. scabies* was increased in the soybean-treated soil. Of the 11 active actinomycetes only one strain was antagonized by *S. scabies*, and all but one strain were antagonistic to other strains of the group to a varying degree. These interrelationships may account for the failure of an arbitrarily chosen antagonist to exert an effect in soil where the influence of other antagonists comes into play.

[893] 631.466.2 : 581.144.2
HOOKER, W. J.; SASS, J. E. **Evidence of parasitic activity of *Actinomyces scabies* on seedling roots.** Abs. in *Phytopath.* 38, 1948 (14).

Actinomyces spp. were more abundant in the rhizosphere of field-grown oat roots than in soil in which there were no roots. When roots of oat plants grown in peat soil were sectioned, filaments of an actinomycete were found in the tissue.

631.468.516 EARTHWORMS

[894] 631.468.516
ESCRITT, J. R.; ARTHUR, J. H. **Earthworm control. A résumé of methods available.** *J. Bd. Greenk. Res.* 7, 1948 (162-172).

[895] 631.468.516 : 631.416.7
PONOMAREVA, S. I. **The rate of formation of calcite by earthworms in the soil.** *C.R. Acad. Sci. (U.S.S.R.)* 61, 1948 (505-507). C.A. 43 (341).

In experiments with *Lumbricus rubellus* and *Allolobophora longa* in soils free from $CaCO_3$ and containing leaves of clover and beets, within 47 days the soils contained numerous crystals of calcite. Control sets had no $CaCO_3$ although the semi-decomposed leaves on top of the soil contained Ca and Mg.

631.48 SOIL FORMATION

(*See also* Abs. Nos. 806, 869)

[896] 631.48
ANDREWS, L. E.; RHOADES, H. F. **Soil development from calcareous glacial material in eastern Nebraska during seventy-five years.** *Proc. Soil Sci. Soc. Amer. 1947*, 12, 1948 (407-408). [Neb. Agric. Expt. Sta., Lincoln]

The top 2 inches of a 75-year-old soil developed on a spoil bank of a railway cutting contained 4.1% of organic matter and 0.176% of N, compared with 0.4% and 0.028%, respectively, at the bottom of the spoil (14-17 inches). $CaCO_3$ was 3.7% at the top and 11.9% at the bottom. The indications are that soil formation was fairly rapid.

[897] 631.48 : 551.4
WOOLDRIDGE, S. W. **Geomorphology and soil science.** *J. Soil Sci.* 1, 1949 (31-34). [King's Coll., London]

The existence of benches marking old erosion surfaces on the dip-slopes of the Chalk country in England is used as an illustration of how the geomorphological evolution of a landscape is reflected in variations in soil type and vegetation.

[898] 631.48 : 551.5
GÈZE, B. Méthode d'étude de la zonalité pédogénétique par la paléopédologie. [**Study of pedogenetic zonation by the paleopedological method.**] *C.R.* 228, 1949 (333-334). [F.]

The geographical and stratigraphical methods of investigating the effect of climate on pedogenesis were compared with special reference to the Midi. It was found that the soil types formed successively at the same place under the influence of climates which varied progressively from equatorial to temperate resemble those found on the surface of the earth from equatorial to temparate regions. The only exceptions occur in the equatorial regions where red clays with dispersed organic matter have formed rather than the black soils with a high organic-matter content indicated by paleopedology. It may be that the red clays are paleosoils formed under the influence of a tropical humid climate with alternating seasons, or that the black carboniferous soils should be compared with mangrove soils.

[899] 631.48 : 551.5
PRESCOTT, J. A. **A climatic index for the leaching factor in soil formation.** *J. Soil Sci.* 1, 1949 (9-19). [Waite Inst., Adelaide]

Evidence has been obtained from the examination of soil boundaries in Australia, the record of drain gauges, the use of water by field vegetation and the measurements of transpiration that the most efficient single-value climatic index is P/E^m, where P represents precipitation, E evaporation from a free water surface, and m is a constant varying from 0.67 to 0.80 with a probable mean of 0.73. A value for this index of 1.1 to 1.5 corresponds to the point where rainfall balances transpiration from vegetation and evaporation from the soil.–Author's summary.

[900] 631.483 : 549.67
PERKINS, A. T. **Reactions of muscovite, bentonite, and their treated residues.** *Soil Sci.* 67, 1949 (41-46). [Kans. Agric. Expt. Sta.]

A study was made of the effect of prolonged grinding, as a partial simulation of weathering, on particle size and chemical reactions of bentonite and muscovite. Particle size was determined by a sub-sieve sizer and by sedimentation in water and subsequent drying at 110°, but agreement between the two methods was not obtained for bentonite. This suggests that continued grinding activates the bentonite particles which polymerize when suspended in water. Base-exchange capacity of muscovite increased with decreasing particle size but that of bentonite decreased after the particles became smaller than 2µ in diameter. Reaction with acids and bases was greatly increased by grinding. Chemical composition, as shown by analyses for SiO_2 and Al_2O_3, and, in the case of muscovite, swelling in water suspension were unaltered, Bentonite, but not muscovite, was decomposed by grinding into its molecular constituents; the coarse particles contained a much higher percentage of SiO_2 than did the fine particles.

631.5 CULTURAL OPERATIONS

(*See also* Abs. Nos. 870, 886)

[901] 631.512
BALDONI, R. Considerazioni agronomiche sull'aratura. [**Agronomic aspects of ploughing.**] *Macch. Mot. Agric.* 6, No. 10, 1948, pp. 14. [I.]

Semi-popular discussion of the purposes and aims of ploughing, with special reference to requirements on heavy impermeable soils in regions of Italy where dry summers and moist winters with irregular distribution of rainfall prevail. The author suggests that the main problem is to conserve winter rainfall, and that that can be attained by deep ploughing so as to minimize run-off and store water in depth. Recently there has been a tendency in America to favour deep ploughing to diminish run-off and erosion rather than to store water. Loss of stored water by evaporation need not be serious under Italian conditions, since later workings produce a dry layer which acts as a mulch. In a truly arid region deep ploughing would favour loss of water.—R.N.

[902] 631.512
HAWKINS, J. C. **One-way ploughing.** *Farm Mech.* 3, 1949 (47-49).

Methods and advantages of, and implements for, one-way ploughing are described.

[903] 631.544.3
GERRETSEN, F. C.; MANTEN, A.; MULLER, F. M. **Investigations concerning the preparation and application of substitutes for the present practice of using stable manure and cereal straw in the biological heating of hot beds.** *Plant and Soil* 1, 1949 (240-263). [Inst. Soil Res., T.N.O. and Expt. Sta. of Util. Straw, Groningen]

In laboratory experiments, straw from oats, barley, wheat, rye, caraway and horse bean raised the temperature rapidly after wetting with a solution of mineral nutrients. The greatest and most rapid rise was in caraway and horse-bean straw and 2 maxima of temperature were reached after 1-2 and 4-7 days. The most suitable sources of additional N were urea, $(NH_4)_2SO_4+CaCO_3$ and NH_4NO_3. $CaCN_2$ was toxic. The addition of super. or K_2SO_4 had little effect on the quantity or rate of heat production. Cereal straw is poor in P and rich in K, and P should be added. Similar results were obtained in field experiments. Urea gave the best results with cereal and caraway straws; horse-bean straw was less satisfactory. The application of cereal or caraway straw with added urea is more economical than using cereal straw with a top dressing of stable manure.

[904] 631.548 : 635
HOMES, M. Possibilité d'application de la culture sans sol à la production végétale. **[Possibility of producing vegetables by hydroponics.]** *C.R. Sem. Agric. Yangambi* 1, 1947 (229-232). [F.]

631.58 AGRICULTURAL SYSTEMS

(*See also* Abs. No. 1109)

[905] 631.58
CHIZHEVSKY, M. G. **[The grass-arable system of agriculture.]** *Pochvovedenie* 1949 (7-17). [R.]

Dokuchaev and Izmaelski had already shown in the 1890's that the apparent desiccation of the steppes when cultivated was the result of a breakdown of soil structure and had advocated various steps whereby soil structure and the moisture regime could be improved and erosion prevented. These included flood-control measures, especially on watersheds, the damming of gullies, the formation of farm ponds, irrigation, the planting of woodlots and complete afforestation of areas unsuitable for cultivation, and correct methods of cultivation. The last point was later stressed by Kostychev who advocated deep autumn ploughing, snow retention and use of fertilizers. These ideas were further developed, on the plant-physiological side, by Timiriazev, and brought to fruition by Williams who developed a complete system of grass-arable agriculture designed to raise the productivity of the great open spaces under a socialist economy. Williams's system requires (1) the planting of protective forests on watersheds, gully slopes, the surrounds of cultivated land, along rivers and around lakes and ponds, and the afforestation of shifting sands; (2) the introduction of "field" and "food" rotations and their correct siting according to topography; (3) correct soil management, especially widespread use of bare fallows and stubble cultivation; (4) rational use of fertilizers; (5) use of crop varieties suited to the locality; (6) irrigation with local supplies of water collected in ponds.

The field rotation should usually be sited on the higher parts of the relief and on slopes and includes annual crops with low water and nutrient requirements and 2 years' grass-legume ley. The food rotation includes 3-6 years' ley and the more valuable grain, vegetable and commercial crops, and is sited in valleys and on lower slopes and gully banks. Other types of rotation can be introduced, if required. By adapting the system of cultivation and the use of the bare fallow according to the aridity of the region the problem of weeds can be largely solved. Examples are given of collective farms on which average yields have shown very marked increases since the introduction of the grass-arable system. Its introduction throughout the Soviet Union is a major feature of the current five-year plan.

[906] 631.58 : 631.81

Bear, F. E. **Intensive agriculture and some related fertilizer problems.** *Proc. Natl. Joint Cttee. Fert. Appl.* 22, 1946 (62-76).

Some of the problems presented by the intensive-farming systems of New Jersey are discussed. These problems comprise those concerned with B, Mg and Mn; nutrient balance; the effect of drying on the physical condition of the soil; application of fertilizers in irrigation water; organic matter; fertilizer placement; the use of phosphate rock and sewage sludge. Tables are included that show the effects of B on yields of lucerne, yields and Ca, Mg and K content of lucerne grown on 10 soils, of various organic-matter programmes on beans and carrots and end amounts of soil organic matter, of fertilizer placement in maize-wheat-clover rotation, of N on grass yields, of frequency of fertilizer application on Ladino clover, of super. compared with phosphate rock, and of sewage sludge compared with cow manure.

[907] 631.589

Henry, J. Les méthodes culturales dans le cadre de la conservation du sol. **[Cultural practices in relation to soil conservation.]** *C.R. Sem. Agric. Yangambi* 1, 1947 (32-42). [F.] [I.N.E.A.C.]

Agricultural progress in Central Africa is traced from the early days when the forests were felled, all timber was burnt, all weeds were destroyed and a single crop was planted. Following rapid exhaustion of the land, cover crops and green manures were introduced, forest cover was not burnt and manures were used, but yields continued to decrease. Recently ploughing has been abandoned, weeding reduced and mixed cropping with long periods of fallow introduced. Methods of native agriculture and types of fallow have been studied for their possible application to more intensive agricultural production.

In this inherently poor land, soil fertility is primarily a question of maintenance of organic colloids; structure, water content and mobilization of mineral elements depend on it. There is a limit of temperature beyond which the transformation of organic colloids into minerals is more rapid than their formation at the expense of plant residues. The speed of this destructive process is a function of the degree of dispersion of the surface soil. The more the soil comes into contact with the atmosphere, the more rapidly is it changed. Once the forest is felled, plant residues decompose rapidly and the balance between organic raw material and organic colloids is disrupted. Frequent ploughing and weeding lead to soil erosion and the mineralization of organic complexes. The use of leguminous crops is insufficient to counteract the high soil temperatures and burying vegetation with high cellulose content only accelerates decomposition.

[908] 631.589

Loeckx, A. Note sur un essai d'enrichissement de la jachère naturelle. **[An experiment in improving a natural fallow.]** *C.R. Sem. Agric. Yangambi* 1, 1947 (182-191). [F.]

Broadcasting a mixture of leguminous seeds without any prior preparation of the soil was compared with two check plots, burnt and not burnt, and with leguminous seeds sown in lines and with cuttings of *Erythrina* and *Albizzia* planted in alternate lines. The broadcast method was the most practical and the most economical.

[909] 631.589

Hamilton, A. P. F. **The problem of shifting cultivation.** *Indian Forester* 74, 1948 (2-6).

Aboriginal tribes in the Eastern States practise shifting cultivation. Attempts are being made to persuade some of them to take up permanent cultivation with a view to preventing the ultimate destruction of the forests, to raise the standard of living of the aboriginals and to prevent them from being exploited. They have to be persuaded to give up land on the hills and they have to be found land nearby at the foot of the hills suitable for permanent cultivation. Several attempts have been successful, factors essential to success including tactful persuasion, but no compulsion; adoption and maintenance of a definite policy; proximity of the new land to the ancestral land; promise of ultimate title in the land; aid in the form of livestock, seed, etc.; legislation to prevent alienation of the land.

[910] 631.589

JANNACCONE, A. La sistemazione del terreno in Capitanata ed il metodo Del Pelo Pardi. **[Soil-working in the Capitanata region and the Del Pelo Pardi method.]** *Ital. Agric.* 85, 1948 -327-334). [I.]

Much labour has been devoted to field improvement in the relatively humid north and centre of Italy during the last two centuries, but no technique of cultivation suitable to the climatic conditions of the south has been adopted. The south has not only less rainfall but a different seasonal distribution and a hotter summer, and some method of storing water in the soil is required to increase yields. Some hill slopes now under cultivation should be returned to pasture or forest. For the plains the Del Pelo Pardi system seems especially well adapted, as it increases soil humidity and thereby yields. It is suggested that the Del Pelo Pardi system of cultivation provides the advantages of tile drainage without its heavy cost; moreover, it can be adopted by peasants using animal traction. Its principal disadvantage is that its effect diminishes after a few years owing to the formation of a compact layer at a depth of 20-40 cm. This drawback of "ageing" might be overcome by ploughing back the ridges every few seasons, thus alternating the lands in ridge and in furrow.—R.N.

[911] 631.589

JOACHIM, A. W. R.; KANDIAH, S. **Soil fertility studies. 2. The effect of shifting (Chena) cultivation and subsequent regeneration of vegetation on soil composition and structure.** *Trop. Agricst.* 104, 1948 (3-11).

While there are some losses of organic matter, N and mineral nutrients as a result of shifting cultivation, these would occur under any system of rotational cropping on new land. There are no appreciable adverse changes in soil structure as a result of shifting cultivation, and the loss of nutrients is not such as to render further cultivation uneconomic. The factors limiting continuance of cultivation on these areas are weed growth, insufficiently burnt stumps which begin to shoot after a year, lack of tillage and, in some areas, erosion. Chena crops depend for their successful growth on the increased available N and ash from burning and the elimination of weed growth by the canopy of tree vegetation. The interval of rest required before the land can be used again for shifting cultivation is governed by the rate of growth of the canopy, and a period of 5-10 years is probably adequate.

[912] 631.589 : 581.5

MAES, J. Observations sur les jachères naturelles et artificielles dans la région cottonière de Gandajika. **[Natural and artificial fallows in the cotton region of Gandajika.]** *C.R. Sem. Agric. Yangambi* 1, 1947 (179-182). [F.]

A list of plants which populate abandoned cultivated land. At the end of the third year elements of savanna association begin to appear. Bush fires break the sequence and encourage the appearance of *Imperata cylindrica*, a plant which is harmful and has to be destroyed not only for cultural reasons but also because its rhizomes harbour the *Monophlebus* sp. which attacks cotton and maize. Manioc and *Pennisetum* make satisfactory types of artificial fallows.

631.6 RECLAMATION. DRAINAGE. IRRIGATION

(*See also* Abs. Nos. 1083, 1087, 1088, 1149)

[913] 631.619

EMPSON, A. **Warping: an old art revived.** *J. Cent. Landowners' Assoc.* 27, 1948 (113-115).

Warping a 60-acre field above the junction of the Ouse and Trent is described.

[914] 631.62 : 631.43

JUUSELA, T. Värme- och fuktighetsförhållanden i dränerade och öppet dikade åkrar. **[Heat and moisture relationships in drained and in ditched fields.]** *Nord. JordbrForsk.* 5-6, 1948 (663-669). [Sw.]

In the spring, covered-drained fields dried more quickly than open-ditched fields, and were 8 days earlier in getting into a cultivable state. Evaporation was less from drained fields, the better structure of which impeded capillary rise to the surface. The moisture content of drained fields was less variable.

In the autumn and until the ground froze there were no significant differences in temperature between drained and ditched fields to a depth of 125 cm. When frost came the drained fields were the warmer, this being related to the lower water table beneath them.

[915] 631.62 : 631.432.3
DAHL, N. J. Det hydrauliske Grundlag for Draenledningers Beregning. **[The hydraulic basis for calculating drain distances.]** *Nord. JordbrForsk.* 5-6, 1948 (657-663). [Da.]

[916] 631.67 : 631.811.91
SCOFIELD, C. S.; HOWE, O. W. **Water input used for field crops at the United States Scotts Bluff (Nebr.) Field Station, 1941-44.** *U.S.D.A. Circ.* 777, 1948, pp. 18.
The study aimed to determine the irrigation water required for adequate water supply to barley, beans, potatoes, sugar beet and lucerne on a very fine sandy loam 1-4 feet deep with a fine-to-coarse sand subsoil containing a discontinuous clay stratum up to 12 inches thick. Drainage conditions were excellent. The total inputs required were 19.2, 22.7, 26.4, 29 and 48.4 inches respectively. The percentage supplied by irrigation varied inversely with the April-September rainfall from 42 to 66 and averaged 56%.

631.8 FERTILIZERS

(*See also* Abs. No. 906)

[917] 631.81 : 545
JACOB, K. D. **Fertilizers.** *Anal. Chem.* 21, 1949 (208-215).
Developments in the analytical chemistry of fertilizers since 1943 are reviewed with reference to sampling, moisture, N, P, K, Ca, Mg, S, B, Mn, Cu, Zn, Co, Mo, Cl, F, CO_2, acid- or base-forming quality and neutralization value. 301 refs.

631.811 PLANT NUTRITION

(*See also* Abs. Nos. 834, 842)

[918] 631.811
HOAGLAND, D. R.; ARNON, D. I. **Some problems of plant nutrition.** *Sci. Mo.* 67, 1948 (201-209). [Univ. Calif. and Calif. Agric. Exp. Sta.]
Plant nutrition is discussed with reference to historical background, relation to animal nutrition, processes of absorption and the use of radio-isotopes.

[919] 631.811 : 631.42
HOMÈS, M. -V. -L. L'utilisation des engrais et la culture sans sol. **[Utilization of manures and hydroponics.]** *C.R. Sem. Agric. Yangambi* 2, 1947 (649-654). [F.] [Brussels]
Various examples are given dealing with the adsorption curves of nitrates and phosphates and the acidity of the medium. These examples, it is alleged, show that it is possible for hydroponic studies to be of assistance in the study of the soil and the interaction of the soil-plant and plant life in the soil.

[920] 631.811.2 : 539.16
HENDRICKS, S. B.; DEAN, L. A. **Basic concepts of soil and fertilizer studies with radioactive phosphorus.** *Proc. Soil Sci. Soc. Amer. 1947*, 12, 1948 (98-100). [U.S.D.A., Beltsville]
Applications of radioactive P to plant and soil research include demonstrations of P mobility in soils, of the uptake and distribution of P in plants and of the proportion of plant P derived from applied fertilizers. In preparing radioactive fertilizers it is essential to achieve a random distribution of P^{31} and P^{32} by chemical precipitation or direct irradiation of a fertilizer material. Experiments in which 0.075, 0.375 and 1.875 mC were added to 3 kg. of soil showed that the growth of perennial ryegrass was unaffected by these levels of radioactivity. The health hazards inherent in work with radioactive materials are emphasized.

[921] 631.811.3
BOURDON, D.; COTTE, J.; TSVETOUKHINE, V. Effets de la carence de potasse sur le dévéloppement des plantes cultivées et sur l'évolution du potassium échangeable du sol. **[Effects of potassium deficiency on the growth of cultivated plants and the evolution of the exchangeable potassium of the soil.]** *C.R. Acad. Agric.* 34, 1948 (777-780). [F.]
Plots with a moderate requirement of K and P received NP and (a) O, (b) 100 and (c) 200 kg./ha. of K_2O as KCl. Potatoes were most sensitive to the absence of K and showed a rapid drop in yield, with a yearly increase in the percentage of tubers weighing <25 g. The leaves from treatment (a) as compared with (b) were richer in N, P, Ca and dry matter, but very deficient in K.

With clover, the yields from (a) dropped greatly from the beginning, but the leaf symptoms of K deficiency did not appear for 12 years. The trends in leaf composition were as for potatoes. Wheat with treatment (a) fairly soon showed deficiency symptoms and the leaf trends resembled those for potatoes, but K fertilizing did not affect the K content of the grain, the composition of which varied much less than that of the rest of the plant. Winter oats, spring barley and buckwheat appeared to draw easily on the soil-K reserves. Brittany soils need at least 125 kg./ha./year of K_2O to maintain a sufficient exchangeable-K content.

[922] 631.811.9
BEAR, F. E. **Minor elements in soils and plants.** *Amer. Fert.* 110, No. 1, 1949 (7-9, 28). [Rutgers Univ., N.J.]

Minor and secondary elements are discussed with reference to the location of minor-element deficient soils, the presence of these elements in organic manures, research at N.J. Agric. Expt. Station, X disease of cattle and the mineral content of vegetables.

[923] 631.811.9 : 539.16
AMERICAN FERTILIZER. **Radioactive materials give crops no benefit, first tests indicate.** *Amer. Fert.* 109, No. 11, 1948 (12-13).

Experiments with low-level radioactive materials in 14 States and with 18 crops have so far shown no beneficial effect upon either crop growth or quality.

[924] 631.811.9 : 539.16
COMAR, C. L. **Radioisotopes in nutritional trace element studies. III.** *Nucleonics* 3, No. 5, 1948 (34-48). C.A. 43 (1841).

The advances achieved by the use of radioactive isotopes to study the place of Zn, Mo and Cu in plant and animal nutrition are reviewed.

[925] 631.811.91 : 631.81
KHANNA, K. L.; RAHEJA, P. C. **The relative efficiency of water requirements in relation to manurial experiments.** *Indian J. Agric. Sci.* 17, 1947 (371-376).

In experiments with sugar cane in auto-irrigators various levels of N, P, K and B were applied at planting and at earthing-up. Water expenditure was determined from the dry weights of plants harvested a year after planting. The relative efficiency of water requirement was increased by fertilizing and was greater when fertilizers were given in one application at planting time than when applied in two doses. K improved and B depressed the relative efficiency of water requirement.

631.816.3 FERTILIZER PLACEMENT

[926] 631.816.3
NATIONAL FERTILIZER ASSOCIATION. **Methods of applying fertilizers.** *Natl. Fert. Assoc. Pamph.* 149, 1948, pp. 28.

[927] 631.816.3
FERTILIZER REVIEW. **Methods of applying fertilizer.** *Fert. Rev.* 24, No. 1, 1949 (11-14).

Recommendations are made of methods of applying fertilizer to lucerne, forage crops, maize, cotton, pasture, field beans, peanuts, small grains, soybeans, sugar beet, tobacco, vegetables, fruits and nuts.

[928] 631.816.3 : 631.435
HESTER, J. B. **The influence of soil type upon fertilization practices.** *Proc. Natl. Joint Cttee. Fert. Appl.* 22, 1946 (57-61). [Campbell Soup Co., Riverton, N.J.]

Big variations in crop yields are given by using the same method of applying fertilizer on different soil types, under different climatic conditions and with different amounts and proportions of available nutrients in the soil. The results of leaching experiments indicate that on sandy soils a larger proportion of the fertilizer should be used as a side dressing and that for heavy soils two-thirds may be ploughed under. The relationship between rainfall and the leaching of chlorides through loam, sandy loam and sand is shown on charts.

[929] 631.816.33 : 631.85
ROBERTS, W. O. **Prevention of mineral deficiency by soaking seed in nutrient solution.** *J. Agric. Sci.* 38, 1948 (458-468). [E. Malling]

After preliminary experiments on the effects of soaking on seeds, field experiments

were conducted on P-deficient soils to determine the effects of soaking seed in one-third its weight of nutrient solution and drying to the original weight. The yield of oats from seed soaked in K_3PO_4 equivalent in amount to 4.6 lb. of P_2O_5 per acre was 25 cwt./acre compared with 17 cwt. from untreated seed. Nearly 75% of the added P was recovered from the harvested grain. In an experiment on clay-with-flints the increase in yield of barley produced by soil applications of super. equivalent to 31 lb. of P_2O_5 per acre was 32.4% and that produced by soaking the seed in K_2HPO_4 solution equivalent to 6 lb. of P_2O_5 per acre was 48.6%. Preliminary experiments on oats grown on Mn-deficient soil suggested that a large part of their Mn requirement can be provided by soaking.

631.82 MINERAL AMENDMENTS. LIME

[930] 631.821.1 : 546.19

MARGULIS, H.; GANE, J. Action du carbonate de chaux sur l'acide arsénieux. **[Action of calcium carbonate on arsenious acid.]** *Ann. Agron.* 18, 1948 (175-178). [F.]

A uniform quantity of a standard solution of As_2O_3 was treated with increasing quantities of a suspension of $CaCO_3$. The quantities of $CaCO_3$ decomposed were insufficient to allow the formation of dicalcium arsenite and thus the precipitation of As_2O_3 from solution.

[931] 631.822 : 552.323.5

REVUE AGRICOLE DE L'ILE MAURICE. Réjuvénation des sols épuisés des régions humides. **[Recovery of exhausted soils in humid regions.]** *Rev. Agric. Maurice* 27, 1948 (155-162). [F.E.]

The report of the sub-committee of the Société des Chimistes et des Techniciens des Industries Agricoles de Maurice on the improvement of exhausted soils is presented. The use of crushed basalt was considered, and a note by O. d'Hotman de Villiers is included.

631.83 POTASH FERTILIZERS

(*See also* Abs. Nos. 840, 1140)

[932] 631.83 : 551.5

'T HART, M. L. **An observation upon the influence of the climate on the effect of potassium fertilizers on grassland.** *Plant and Soil* 1, 1949 (264-270). [Cent. Inst. Landbouw. Onderz. Wageningen]

The effect of dressings of K_2O on grassland or peat soil depended on the temperature during the growing period. At 10°C., yields from plots without K remained 20% behind those receiving K; at 19°C. and higher, plots without K gave yields as high as or higher than those receiving K. Sunshine had little if any influence. On a grazed plot, the percentage of K in the grass increased with increasing temperature during the growing season. On a mown plot the effect of temperature was not marked, because of the withdrawal of K at each mowing.

[933] 631.83 : 581.192

BOURDON, D.; COTTE, J.; TSVETOUKHINE, V. L'influence de la carence potassique prolongée sur le rendement et la composition chimique de quelques plantes cultivées. **[The influence of prolonged potassium deficiency on the yield and chemical composition of some cultivated plants.]** *Bull. Tech. Inform. Ing. Serv. Agric.* No. 32, Sept. 1948. [F.]

Continued lack of application of K fertilizer to silt soils results in decreased yield. Potatoes are most sensitive. The percentage of K in the entire plant becomes low, but the N, P and lime contents increase. Application of K fertilizer increases the K content and decreases that of the other elements. The chemical composition of wheat grain is not altered much by deficiency or by addition of K.

[934] 631.831 : 553.97

VINOGRADSKY, B. M. **[Peat ash—a valuable fertilizer for potatoes.]** *Sad i Ogorod* No. 1, 1949 (76-79). [R.]

Experiments on leached chernozems showed that peat ash was as effective as wood ash and more effective than K salts as fertilizer for potatoes. It was even more efficient in increasing yields on acid podzolized soils owing to its high Ca content. The amount applied has to be 3 or 4 times greater than that of wood ash.

631.84 NITROGEN FERTILIZERS

[935] 631.84
BALLS, W. L.; GRACIE, D. S.; KHALIL, F. **Evaluating the effect of nitrogenous fertilizers by combining statistical and agronomic data.** *Egypt Min. Agric. Chem. Sect. Bull.* 249, 1948, pp. 35.

Annual statistics for 1913-1940 of the national total yields and areas of wheat, rice, maize, barley and cotton and of N-fertilizer imports are interpreted by the use of experimental data for 1931-40 on the response of these crops to N in order to infer what fraction of the N went to each crop and to what extent the yields were affected by fertilizing and other factors.

From the experimental data the average yield per feddan for each crop and year and also the response curves for differential N fertilizing are obtained. A figure for "intensity of N manuring" expressed in kg./feddan is obtained for each year by dividing the weight of N fertilizer imported by the total cropped area. This figure can be converted into crop-yield terms (ardebs/feddan) by using the response curve for the crop concerned.

For each crop, average yield is plotted against (1) area sown and (2) intensity of manuring. All crops except rice (in which yields were correlated with (1)) showed a strong positive correlation between yields and (2). Cotton had to be treated as 2 crops, Upper- and Lower-Egyptian, as the crop in Upper Egypt has a higher unfertilized yield than that in the Delta and responds more to a given quantity of N, apparently because of temperature differences. For each crop except rice the 5-year running average through recorded yields/feddan is plotted and compared with the yield curve corresponding to the intensity of manuring derived from the response curve. It is concluded that for wheat the average unfertilized yield would be about 4.75 ardebs/feddan and that the crop as a whole never benefited from more than 60 kg./feddan of N fertilizer, the figures for barley and maize being 5.61, 50; 6.52, 54. The amount of fertilizer going to a given crop in any year is calculated from the difference between the smoothed yield curve and the base line for no fertilizer. About half of the N goes to cotton in Upper Egypt, much less to Delta cotton and still less to wheat. The effect of temperature is discussed. The period when import of N fertilizers was greatest occurred when temperatures happened to favour benefit from their use. "When temperatures fall again opinion as to their utility will equally undergo revision."

[936] 631.84
FERTILIZER AND FEEDING STUFFS JOURNAL. **World fertilizer nitrogen.** *Fert. Feed. J.* 35, 1949 (41-44).

Details of the world and home production and consumption of fixed nitrogen are given, as presented in the 28th annual report of the British Sulphate of Ammonia Federation.

[937] 631.84 : 577.16
ÅBERG, B.; EKDAHL, I. **Effects of nitrogen fertilization on the ascorbic acid content of green plants.** *Physiol. Plant.* 1, 1948 (290-329). [Roy. Agric. Coll., Uppsala]

Spinach, lettuce, radish, kale, tomato, wheat and parsley were grown in greenhouse beds or pots and supplied with various amounts of NH_4NO_3. In the sub-optimum fertilization range where yields increased with increasing N supply there was a slight decrease in the ascorbic-acid content of the mature leaves, and an increase or constant level in young growing leaves. In the supra-optimum range where yields decreased with increasing N supply, ascorbic-acid and dry-matter contents rose with the higher rates of application of N. The initial decrease of ascorbic acid was not shown for wheat and parsley. Treatment of spinach with increasing amounts of NaCl resulted in lower ascorbic-acid contents.

[938] 631.84 : 631.816.2
COÏC, Y. L'apport, à dose normale, et à une époque favorable, d'engrais azotés immédiatement assimilables peut provoquer ultérieurement un besoin supplémentaire d'azote. **[The normal and timely application of rapidly assimilable nitrogen may later cause a need for supplementary nitrogen.]** *C.R. Acad. Agric.* 35, 1949 (79-82). [F.]

Winter wheat was given 30 kg./ha. of N in March, with or without 30 kg./ha. in May. The second application caused a definite increase in the number of grains produced and in the 1000-grain weight.

[939] 631.841.5
CHEN, C. T.; CHANG, J. M.; WEI, C. T. **A study on the application of calcium cyanamide to soils.** *J. Soc. Chim. Trop. Agric.* 1, 1948 (36-51).

200 g. of 14 different soils was mixed thoroughly with 20 mg. of N in the form of freshly powdered calcium cyanamide, moistened to optimum moisture content and analysed for pH and cyanamide N retained. The pH decreased as the cyanamide disappeared from the soils. The pH decrease was slight in acid soils. When cyanamide was incorporated in the soil with the same quantity of straw ash, super. or K_2SO_4 or 10-30 times its weight of compost, the removal of cyanamide was hastened from both sandy and clayey soils. The efficiency of the added fertilizers varied with the moisture content of the soil; a soil with optimum moisture content was most favourable to the removal of the toxic substance. Mixing Ca cyanamide with 10-30 times its weight of straw ash retarded the disappearance of the cyanamide. In the paddy-soil state none of the incorporated materials had any effect on the removal of cyanamide. When the soil contained 0.20-0.16 mg. of cyanamide N per 100 g. of soil, the cyanamide was injurious to seedlings of rice and sweet potatoes.

[940] 631.842.4 : 631.812
KREVELEN, D. W. VAN **[A few aspects of the development and technology of the nitrogen industry.]** *Chem. Weekbl.* 44, 1948 (437-445). C.A. 43 (1536).

The manufacture and oxidation of NH_3 and manufacture of NH_4NO_3 fertilizers are reviewed.

[941] 631.847.2 : 631.461.51
POCHON, J.; CHALAUST, R.; TCHAN, Y. T. Inoculation d'azotobacter dans le sol. Fixation d'azote et croissance des végétaux. **[Soil inoculation with azotobacter. Nitrogen fixation and plant growth.]** *C.R. Acad. Agric.* 34, 1948 (791-794). [F.]

Soil as poor as possible in N (0.1%), 15% of whose particles were colonized by azotobacter, was sieved and 0.1% of glucose and 0.5% of $CaCO_3$ were added, the whole being brought to 20% humidity with a solution containing 0.5% of K_2HPO_4 and 0.3% of $MgSO_4$. Layers 3-5 mm. deep were kept at 28° for 4 days under humid conditions and 4 days under drying conditions. The soil, now 100% colonized, was added at 100 g./square m. to half of the field plots, which were under bare fallow, oats or oats+mineral N. Satisfactory proliferation and N fixation occurred, but the soil enrichment had no favourable effect on the oat crop, presumably because mineralization of the fixed N had not yet occurred. Similar results were obtained with *Clostridium pastorianum.*

631.85 PHOSPHATE FERTILIZERS

[942] 631.85 : 631.414.3
HESTER, J. B. **The fate of phosphate soil supplements.** *Amer. Fert.* 109, No. 13, 1948 (7-9, 24); 110, No. 1, 1949 (11, 24, 26). [Campbell Soup Co., Riverton, N.J.]

Research on the availability of P soil supplements is discussed with reference to the amount and composition of clay and of organic matter, soil reaction and replaceable bases, drainage and microbiological activity, season and temperature, amount and composition of P supplements, and crop rotation and test crop used.

[943] 631.85 : 631.812
HUDSON, E. P. **T.V.A. phosphatic fertiliser technology.** *Fert. Soc. Pap.* 1948 (10-25).

The methods used by the T.V.A. of producing elemental P, H_3PO_4, triple super., Ca metaphosphate and fused tricalcium phosphate are outlined.

[944] 631.85 : 631.815
RHODE ISLAND AGRICULTURAL EXPERIMENT STATION. **Residual effects of phosphate.** *R.I. Agric. Expt. Sta. Rept. 1946-47,* 1947 (10).

Potatoes were grown on 9 plots where P from different sources and in varying amounts had been compared for more than 40 years, but no P had been applied since 1941. Yields were 168 bu./acre after basic slag, 175 bu. after super., 176 after rock phosphate and 182 after bonemeal. The no-phosphate plot gave 159 bu. There was little difference in the residual P as measured by potato yields.

[945] 631.855 : 539.215

NORDENGREN, S. **Granulation of phosphatic fertilisers—theory and practice.** *Fert. Soc. Pap.* 1948, pp. 12.

A lecture recording some experiences of the Swedish Bureau of Soil Research in experiments with granulated super. and in its manufacture. In experiments in boxes, compact bundles of fine roots were developed round the granules, which remained unaffected by fixation. The average lactate value was 1.7 units between the bundles and 14 on the soil closest to them. In several hundred tests on Swedish soils poor in P, granular super., especially when drill-sown, had a far bigger effect on yields than ordinary super. Drill-sowing of granulated super. appeared to be the only method giving a good economic result in dry years. A continuous-working granulation plant to produce 25 tons/hour is shortly described with a discussion of various difficulties and devices.

631.86/7 ORGANIC FERTILIZERS

(*See also* Abs. Nos. 887, 961, 1138)

[946] 631.86/7 : 631.445.7

HENDERICKX, J. Note sur la conservation de la fertilité des sols dans les cultures de haute altitude du Congo. [**A note on the conservation of soil fertility in high-altitude crops in the Congo.**] *C.R. Sem. Agric. Yangambi* 1, 1947 (94-96). [F.] [I.N.E.A.C.]

In both native and plantation agriculture the use of composts or manures is recommended. For instance in pyrethrum plantations, although the anti-erosion measures are perfect, the soil becomes exhausted in 4-5 years and the use of 80 tons of compost in a plantation increased production from 300 kg. of dry flowers to over 1500 kg./ha. *Crotalaria agathiflora* planted on a fallow helped to improve the soils.

[947] 631.86/7 : 631.445.7

SODY, L. Les engrais et les sols coloniaux. [**Manures and colonial soils.**] *C.R. Sem. Agric. Yangambi* 1, 1947 (192-198). [F.]

A general discussion of plant nutrition in tropical as compared with temperate soils, emphasising the importance of organic matter in avoiding excessive fixation of P.

[948] 631.86

OLOFSSON, S. Några undersökningar rörande den fasta spillningen på betesvallarna. Dess mängd och beskaffenhet samt genom denna uppkommen marktäckning. [**Some investigations concerning the solid droppings on pastures. Their quantity and properties and the area covered by them.**] *Svenska Vall- o. MosskFören. Kvartalsskr.* 10, 1948 (178-190). [Sw.]

Measurements showed that the area covered by heaps of droppings in a fully utilized pasture grazed by cattle reached about 3% of the total area after 2-3 years. Thereafter the rate of decomposition equalled the rate of new accession of droppings. A considerably larger area is, however, rendered useless for grazing, as cattle will not eat the overgrown grass in the neighbourhood of droppings. Horse droppings rarely covered more than 0.5% of the total area. To avoid waste of pasture land and to promote decomposition, droppings should be spread regularly and evenly.

[949] 631.86 : 593.9

LEE, C. F. **Technological studies of the starfish. V. Starfish as fertilizer.** *Com. Fish. Rev.* 10, No. 6, 1948 (11-16). C.A. 43 (1892).

Raw starfish is a fair source of N, containing about 4.5% on a dry-weight basis, but a very poor source of P and K. The $CaCO_3$ content is about 60%. To delay decomposition, 1.5% by weight of H_2SO_4 must be added to the raw starfish.

[950] 631.86 : 631.81

MIDGLEY, A. R. **Applying fertilizer with dairy manure.** *Proc. Natl. Joint Cttee. Fert. Appl.* 22, 1946 (52-57). [Vt. Agric. Exp. Sta.]

The advantages obtained by adding super., K, N and B to dairy manure are discussed. The use of K in the stable gutter is not recommended but it is often advisable to add K at the time of spreading, provided that the ground is not frozen. Absorption of K by the moist manure maintains its availability for plant use over a longer period than when K and manure are applied separately. Addition of super. conserves manurial N which would otherwise be lost into the air, and increases P availability to plants. For crops with high N requirements N should be added to the loaded manure

spreader to replace that lost as NH_3 during handling. Borax can be applied with manure and helps in fly control; it is most effective when applied to the clean gutter.

[951] 631.87
BOISCHOT, P.; BARBIER, G. Notes sur le fumier artificiel et quelques autres sources d'humus. **[Notes on artificial manure and some other sources of humus.]** *Ann. Agron.* 18, 1948 (562-569). [F.]

The composition of cereal straws and the effects of direct incorporation of straw, peat and sawdust into the soil are briefly discussed. The preparation of artificial manure from these 3 sources of organic matter is described. Peat, whether neutralized or not, mixed with straw, provided with various sources of N and with PK hardly ever showed signs of fermentation. Beech sawdust treated with 10 kg./ton of $(NH_4)_2SO_4$+PK decomposed much more slowly than straw and caused a 16% depression of potato yields when applied at planting, after 4 months of fermentation.

[952] 631.876.9 : 633.913.31
BENEDICT, H. M. **The effect of waste products from the guayule rubber mill on the growth of various crops.** *J. Amer. Soc. Agron.* 40, 1948 (1005-1016). [Rubber Res. Sta., U.S.D.A., Salinas, Calif.]

Addition to the soil of parboiled leaves of guayule and of the filtered effluent in which guayule roots and stems were ground, increased the dry weight of lettuce, cotton, maize and pinto beans. Addition of dry leaves of guayule inhibited growth temporarily, but after a few weeks the dry weight of plants decreased. When the effluent was not filtered to remove bagasse, growth was retarded in the seedling stages. With heavy applications of bagasse, the seedlings died soon after emergence. The effect of the various mill wastes was due to their effect on available N in the soil and not to the presence of any growth-regulating substance in the guayule material. The leaves and effluent increased available N and the bagasse made the N in the soil unavailable because of its high-C, low-N content. The inhibiting effects of bagasse were eliminated by the addition of $(NH_4)_2SO_4$ with the bagasse.

[953] 631.878
PLAUT, M.; HURWITZ, S. **Organic substitutes for animal manure. I. Huminal.** *Rehovot Agric. Res. Sta. Bull.* 46, 1948, pp.35.

There was no marked difference between the effect of the organic matter contained in Huminal A and B and that in stable manure on a medium sandy clay. Huminal A is peat treated with ammonium bicarbonate and contains a minimum of 60% of active organic matter and 2.5% of N, $\frac{2}{3}$ of which is easily soluble. Huminal B contains in addition 1.3% of P_2O_5 and 2.1% of K_2O. Yields from plots to which Huminal or stable manure was applied were greater than from plots receiving chemical fertilizers of equal nutritive value.

[954] 631.879.1
MARX, T.; SAHM, U. **[Physical structure of town refuse.]** *Deut. Landw.* 2, 1948 (69-70). B.A. BIII, 1948 (417). [G.]

After decomposition and reduction to an earthy consistency, town refuse is suitable for use as a fertilizer if the water capacity exceeds 50% and the content of fine particles +colloids exceeds 25%, the contents of clay, fine sand and coarse sand being approximately equal. It may be used in amounts of not more than 30 kg./square metre on any soil not intended for growing grain or beans.

[955] 631.879.2
DAS, S. **Activated sludge as a manure.** *Indian Farm.* 9, 1948 (364-367).

The yields of oats and barley grown on plots receiving activated sludge compared favourably with the yields from plots manured with either $(NH_4)_2SO_4$ or niciphos. Data on the manurial constituents of activated sludge are tabulated.

[956] 631.879.3
BOISCHOT, P.; BARBIER, G. La sciure de bois comme source d'humus. **[Sawdust as a source of humus.]** *C.R. Acad. Agric.* 34, 1948 (901-902). [F.]

$3\frac{1}{2}$ tons of beech sawdust were fermented with 36 kg. of $(NH_4)_2SO_4$, small quantities of rock phosphate and KCl and 60 kg. of farmyard manure. After 3 months the mass had turned brown and after 6 months the humic-acid content was 9.1% compared with an initial value of 1.5%. Sawdust decomposed more slowly than straw and if applied to the soil in an insufficiently fermented condition would immobilize soil N. Its value as a manure was equivalent to that of straw.

[957] 631.879.3 : 631.415.1
McCool, M. M. **Studies on pH values of sawdusts and soil-sawdust mixtures.** *Boyce Thompson Inst. Contr.* 15, 1948 (279-282).

The pH values of sawdust from different trees were ascertained; some became higher after leaching with distilled water. Addition to soil of sawdust from some species increased the pH and from other species decreased the pH. Coarse materials such as shavings increased the rate of percolation of water through silt loam.

631.89 MIXED AND COMPOUND FERTILIZERS

[958] 631.893 : 631.812
Hamm, G. G. H. Le développement de quelques engrais composés. **[The manufacture of some compound fertilizers.]** *Chem. Indust.* 60, No. 3, 1948 (74). [F.]

At the State mines a compound fertilizer is prepared by decomposing crude phosphate with HNO_3. After cooling, during which $Ca(NO_3)_2$ crystallizes out, NH_3 is introduced into the mother liquor to form NH_4NO_3 and phosphates. KCl or KNO_3 is then added. This method of preparing a NPK fertilizer is more economical than mixing the separate components.

632 PLANT DISEASES. WEEDS AND PESTS. PLANT PROTECTION

(*See also* Abs. Nos. 892, 975, 992, 1003, 1007, 1013, 1027, 1049, 1050)

[959] 632.187
Graeme, A. de Des feux de brousse. **[Bush fires.]** *C.R. Sem. Agric. Yangambi* 1, 1947 (233-241). [F.]

Discussion on bush fires, measures suggested for prevention, legislation, fire lanes, windbreaks of *Acacia decurrens* and *Eucalyptus*.

[960] 632.187 : 34
Loeckx, A. Législation et feux de brousse. **[Legislation and bush fires.]** *C.R. Sem. Agric. Yangambi* 1, 1947 (251-253). [F.]

Suggested amendments to existing legislation.

[961] 632.191 : 546.711 : 631.879.2
Barbier, G.; Trocmé, S.; Chabannes, J. Carence de manganèse provoquée par l'irrigation à l'eau d'égout. **[Manganese deficiency due to irrigation with sewage effluents.]** *C.R. Acad. Agric.* 34, 1948 (910-912). [F.]

The chlorosis of pears, spinach, beans and peas encountered in an area irrigated with sewage effluents responded to spraying with a solution of $MnSO_4$. The soil under affected pear trees contained 9 p.p.m. of Mn compared with 15 p.p.m. in soil under adjacent healthy trees. The incidence of the disease is thought to be related to the deposition of humates and lime on the surface of the soil particles.

[962] 632.2 : 632.953
Smith, W. P. C. **The control of root-knot or eelworm-gall disease by soil fumigation with D-D.** *J. Agric. W. Aust.* 25 (s.s.), 1948 (283-290).

D-D poured at the rates of 5 c.c. and $2\frac{1}{2}$ c.c. into holes 6-8 inches deep and spaced one foot apart in staggered rows and immediately covered with soil was effective in controlling the disease. The ground should be well dug and prepared before treatment, large clods being broken down and time allowed for residues from former crops to rot, as otherwise root galls in the clods may escape the fumigant. A soil-injection gun is more suitable for large areas. The ground is best watered after application so that the surface 2 inches are moistened in order to prevent the fumes escaping. After a fortnight the ground should be dug over to allow fumes to escape and should be planted 3 weeks after the initial treatment. At $2\frac{1}{2}$ c.c./per foot the amount used per acre would be approximately 29 gallons. Yields of carrots were increased by 20% and the percentage of first-grade carrots was doubled by both the 5 c.c. and $2\frac{1}{2}$ c.c. applications. In most cases roots were almost free from galls.

[963] 632.7 : 634.1
Tunblad, B. Giftkli mot jordflylarver i plantskola. **[Cutworm control in the nursery by poisoned bran.]** *Växtskydds-notiser* 1947, No. 4 (53-55). Hort. Abs. 18 (184).

Larvae of the turnip moth, *Agrotis segetum*, were destroyed in apple and pear nurseries with bait consisting of 50 kg. of wheat bran mixed dry with 3 kg. of 100% Cryocide and

moistened with 40 l. of water in which 3-4 kg. of sugar had been dissolved. This quantity of bait was applied in the evening to 11,000 m. of tree row and a kill of 90% was achieved.

[964] 632.732 : 632.951
MALLAMAIRE; ROBLOT. Sur l'emploi de l'hexachlorocyclohexane et du sulfure de polychlorocyclane dans la lutte contre les termites au Soudan Français. **[The use of hexachlorocyclohexane and polychlorocyclane sulphide against termites in the French Sudan.]** *C.R. Acad. Agric.* 34, 1948 (941-942). [F.]

Parasitic gummosis on citrus caused by *Phytophthora citrophthora* and *P. parasitica* is aggravated by termites which attack the bark; they do not attack healthy trees. Application once every 3 months of hexachlorocyclohexane or polychlorocyclane in powder form around the foot of the tree, followed by irrigation, controls the termites.

632.95 FUNGICIDES. INSECTICIDES. HERBICIDES

(*See also* Abs. Nos. 962—4, 1022)

[965] 632.95
WELLMAN, R. H. **Synthetic chemicals for agriculture. I. Fertilizers and insecticides. II. Fungicides, nematocides, rodenticides and weed killers.** *Chem. Inds.* 62, 1948 (914-921); 63, 1948 (223-239). C.A. 43 (1891).

[966] 632.951
SAKIMURA, K. **Residual toxicity of hexachlorocyclohexane incorporated in soil.** *J. Econ. Ent.* 41, 1948 (665-666). C.A. 43 (1022).

Benzene hexachloride at 4.5 lb. of γ-isomer per acre and mixed with the top 12 inches of soil gave 98% kill of *Anomala orientalis* larvae immediately after application, and 71.5% kill in 19 months. Kills at other rates were: 100% and 92% at 7.5 lb./acre; 100% and 99% at 12 lb./acre; 100% and 100% at 15 lb./acre. DDT at 25 lb./acre gave 91% kill immediately, 86.1% in 8 months and 40% in 26 months; at 50 lb./acre kills were 100%, 95.6% and 50% respectively. Benzene hexachloride did not decrease germination of garden-pea seed up to 60 lb./acre, but slightly affected plant growth at 15 lb. and caused severe injury at 60 lb.

[967] 632.953 : 635.935.722
TISDALE, W. B.; RUEHLE, G. D. **Pythium root rot of aroids and Easter lilies.** *Phytopath.* 39, 1949 (167-170). [Fla. Agric. Expt. Sta., Gainesville]

Tersan (tetramethyl thiuram disulphide) and Fermate (ferric dimethyl dithiocarbamate) showed promise for the eradication of Pythium root-rot fungus from the soil. After greenhouse plants were set in infested soil wetted with a solution containing 1 or 2 g. of the chemical in 2 pints of water, the roots were not injured and both concentrations prevented infection. In outdoor tests there was no benefit when 1 pint/sq. ft. was dug into the soil immediately before setting the plants and at 30-day intervals.

[968] 632.954 : 577.17
WINDERS, C. W. **"Hormone" weed-killers.** *Queensland Agric. J.* 67, 1948 (195-199).

List of susceptible plants.

[969] 632.954.6
KONING, H. Kalkstikstof als onkruidbestrijdingsmiddel. **[Weed control by means of calcium cyanamide.]** *LandbVoorlD. Wag. Meded.* 56, 1948, pp. 50. [Du.e.]

Loss of grain in Holland due to weeds was estimated at 20 million kg. for 1938. One of the most generally used chemicals for weed control is $CaCN_2$ whose effect is due to the formation of free $NH_2.CN$ by the action of moisture. Oiled $CaCN_2$ should be applied at a rate of 250-350 kg./ha. after the cereal has formed 4-6 leaves. If lodging is likely to occur the $CaCN_2$ can be partly replaced by kainite. Apart from weed control, application of $CaCN_2$ increases the yield of straw and of undersown crops and appears to check eyespot disease. If the cereal crop has been weakened by severe winter weather, nitrate fertilizers should be applied and weeds controlled by other methods. $CaCN_2$ should be applied 1-3 weeks after planting potatoes and a fortnight before sowing beet. Its use is not advisable with peas unless many weeds are present, or with flax, spinach, radish and beet-seed crops. $CaCN_2$ controls several pasture weeds and can be used successfully in bulb culture. Weeds which can be controlled are listed, but it is emphasized that control by any chemical cannot replace that by hoeing. 140 references.

[970] 632.954.6 : 631.875
RHODE ISLAND AGRICULTURAL EXPERIMENT STATION. **Weed seeds in soil and compost.** *R.I. Agric. Expt. Sta. Rept. 1946-47*, 1947 (42-44).

Compost may be sterilized by mixing 13 lb. of Granular "Aero" Cyanamide, a lime-nitrogen fertilizer containing 20.6% of N with each cu. yd. of compost screened through a ¼-inch mesh. The cyanamide kills all weed seeds in 4-6 weeks. The sterilized compost, fertilizer and lime may thus be applied as top-dressing in one operation.

633.1 CEREALS

(*See also* Abs. Nos. 853, 1105)

[971] 633.11-1.543
NEVANO, G. La coltivazione dell' avena confrontata a quella del frumento. Orientamenti verso una nuova tecnica colturale. [**Oats compared with wheat as a crop: steps towards a new mode of cultivation.**] *Ital. Agric.* 86, 1949 (36-42). [I.]

In 1934-35, trials with *Mentana*, a wheat variety shy to tiller, indicated the advantages of thin and early sowing on upland soils. A trial on five plots was therefore made on a volcanic soil at an altitude of 1500 feet with a local variety of winter oats sown at the rate of 150 kg./ha., also with a half and a third of that quantity given NP and sown 22 days earlier. The thin and early sowings produced much the tallest plants and greatest number of total and productive ears per plant; the yields of grain and straw were significantly greater from thin sowings than from unmanured thick sowing, though not much greater than from late thick sowing given NH_4NO_3 without P. Corn weight was not affected, and hectolitre weight was possibly improved by the experimental treatments. The advantages of thin and early sowing coupled with nitrogenous fertilizing are regarded as established.—R.N.

[972] 633.11-1.811.91
CAVANILLAS, L. Estudios sobre transpiracion vegetal. Experiencias con trigo cultivado en lisémetros. [**Transpiration studies. Experiments with wheat in lysimeters.**] *An. Inst. Esp. Edafol.* 7, 1948 (187-200). [Sp.]

The study aims at determining the effect of different water treatments on the yielp and quality of wheat. The first year's data are presented of rainfall, irrigation, drainage, relative humidity, evaporimeter readings and transpiration. The height of plants, weight of grain and straw and the water required to produce 1 g. of dry weight are also given for the 7 treatments, in 4 of which an abundance of water was given with 4 different fertilizer treatments while in the other 3 the effect of water deficiency at different growth periods was studied.

[973] 633.11-1.874 : 581.192
GRAHAM, S. C. **The loss of soil fertility in New South Wales as reflected by depleted nitrogen content and its effect on the baking quality of wheat.** *J. Aust. Inst. Agric. Sci.* 14, 1948 (194-195).

Results of 2 years' experiments show that depleted N content in wheat grain is accompanied by low protein, low yields and the incidence of mottling. The ploughing-in of green crops increased the protein content and produced clear grain.

[974] 633.15-1.84
VITTUM, M. T. **Sidedressing sweet corn with nitrogen.** *Amer. Fert.* 109, No. 10, 1948 (11, 28).

Various experiments on the treatment of sweet corn with N fertilizers are described. Results indicate that N starvation can be corrected by side-dressing at the proper time—usually at the last cultivation—provided that adequate rainfall follows to wash down the N to the region of the plant roots.

[975] 633.15-2.7-1.5
ILLINOIS AGRICULTURAL EXPERIMENT STATION. **Corn borer control in field corn.** *Ill. Agric. Expt. Sta. Circ.* 637, 1949, pp. 16.

Corn borer (*Pyrausta nubilalis* Hbn.) can be controlled on fertile soils by planting late enough to escape early-season infestation, but very late planting may build up late-season borers which would attack the following crop. The pest is not attracted to maize on soils of low fertility. The use of fertilizers must be avoided with early-planted crops, but is beneficial on late maize. Ploughing-in crop remnants destroys overwintering borers but burning the maize stalks is not recommended. A suitable rotation for infected areas is maize-soybeans-small grain-clover.

[976] 633.18-1.415.3
ASGHAR, A. G.; DHAWAN, C. L. **Effect of irrigation and growing rice on saline soils. I. Manganese, nitrogen and phosphate status of soil.** *Indian J. Agric. Sci.* 17, 1947 (199-202). [Irrig. Res. Inst., Lahore]

Samples were taken from *thur*, i.e., land which has deteriorated due to the development of salinity, before and after reclamation by irrigation and planting to rice. Nutrient contents before and after reclamation were: 3.3 and 2.6 m.e. of Mn, 34.0 and 15.9 mg. of N, 5.3 and 3.5 mg. of $NaNO_3$ per 100 g. of soil, and 14.3 and 12.6 p.p.m. of P_2O_5 for the first foot of soil. Corresponding values for the 1- to 2-ft. depths were: Mn, 3.6 and 3.2; N, 27.4 and 15.6; $NaNO_3$, 4.5 and 1.8, and P_2O_5, 15.0 and 10.9. To maintain fertility it would be necessary to manure the soil after rice cultivation with a leguminous crop which would supply the requisite amounts of these nutrients.

[977] 633.18-1.416.1
CHEN, H. K.; SHIAO, T. H. **Inorganic compounds of nitrogen in rice field soils.** *Quart. J. Sci., Wu-Han Univ.* 9, 1948 (79-88). C.A. 43 (341). [E.]

A rice-field soil derived from purple sandstones and shales, of pH 6.5, total N 0.09% and C/N ratio 13 : 1, contained N chiefly as NH_3 with only traces as NO_3 and NO_2 while under water for cultivation. When the soil was drained for a winter crop, a slow nitrification took place, but NO_3 and NO_2 produced were still less than the residual NH_3. Upon reflooding, NO_3 and NO_2 are reduced rapidly, probably within a single day.

[978] 633.18-1.466.1
ROY, T. C. **Study on the soil fungi of the paddy fields of Bengal.** *Bull. Bot. Soc. Bengal* 2, 1948 (28-35). R.A.M. 28 (141).

Studies of rice-field soil fungi at the Chinsurah Agricultural Farm showed that *Aspergillus niger* was present in all soil samples at depths from 1 to 6 inches, with the greatest number at 4 inches.

[979] 633.18-1.543
HEDAYETULLAH, S.; ROY, K. P.; SEN, S. **A study on the effect of cultural factors in transplant paddy on the behaviour of some plant characters influencing the yield.** *Indian J. Agric. Sci.* 17, 1947 (69-80). [Agric. Res. Sta., Dacca]

Seedlings of an early and late strain of rice were transplanted at spacings of 6, 9, 12 and 15 inches with single and 3-4 seedlings per hole. The number of fertile tillers was greater with 3-4 seedlings per hole and decreased with closer spacing. Length of panicle and yields increased with wider spacing.

[980] 633.18-1.81
DAVE, B. B. **Manurial requirements of rice in the Central Provinces.** *Indian J. Agric. Sci.* 17, 1947 (245-260). [Rice Res. Scheme, Raipur, C.P.]

In five-year fertilizer experiments on light sandy and clay-loam soils, high and profitable yields were obtained only with N+P fertilizers, the most effective N : P_2O_5 ratio being 1 : 1. Application of 20 lb. of N as $(NH_4)_2SO_4$ with 20 lb. of P_2O_5 as double super. increased paddy yields from 988 lb. to 2,122 lb./acre. P_2O_5 was the limiting factor on very light soils which did not respond to N alone. Inorganic N fertilizers alone or mixed with organic manure gave higher yields than farmyard manure applied on the same N basis. Applications of 40 and 60 lb. of N as compost, groundnut cake and *Sesamum* cake increased yields by 47 and 68%, 59 and 88%, and 72 and 105% respectively. Groundnut cake was applied to light soil, *Sesamum* to heavy soil and compost to both types. Recommendations based on these results are made.

[981] 633.18-1.841.1
RHIND, D.; TIN, U. **Deleterious effects of nitrogenous dressings when used alone on Burma paddy soils.** *Trop. Agricst.* 104, 1948 (12-16). [Agric. Dept., Burma]

Applications of $(NH_4)_2SO_4$ used alone gave significant increases in yield in the first year; this declined yearly during the first 5 years and showed a significant depression in the succeeding 5 years when no fertilizer was applied.

[982] 633.18-1.874 : 616.936
MASILAMANI, S. G.; RAMOO, H. **Experiments on green manure crop culture as a measure of control of *A. culicifacies* breeding in paddy fields.** *Indian J. Agric. Sci.* 16, 1946 (492-500). [Reg. Malaria Organiz. Pattukottai]

The rice-field factor in malariogenesis is considered with special reference to the Pattukottai area where malaria was recently introduced as a result of a new irrigation

project. Examination of possible breeding places showed that the control of the vector *Anopheles culicifacies* could be confined to the paddy fields. There was a rapid rise in the output of adults and larvae when the fields were in the wet fallow stage. As active breeding continued until the rice plants were a foot high an attempt was made to prevent oviposition during the wet fallow period by sowing *kolingi* (*Tephrosia purpurea*), daincha (*Sesbania aculeata*) and sunnhemp (*Crotalaria juncea*). These green-manure crops reduced the number of *A. culicifacies* larvae to less than 4% of the total identified, and may help to solve the manurial problem where farmyard manure is difficult to obtain.

[983] 633.19-1.5
VALLAEYS, G. Le "Coix Lachryma-Jobi." **[Adlay.]** *Bull. Agric. Congo Belge* 39, 1948 (248-304). [F.] [I.N.E.A.C.]

Adlay prefers loose deep rich soils, but produces well on all but very heavy or gravelly ones. It tolerates dry conditions better than rice or maize, and requires good drainage and a regular supply of rain during the first few months of growth. It is sown preferably as the first crop after the fallow and requires deep cultivation and hoeing, with a raking 10 days before sowing. Its effect on the soil and on following crops is good.

633.2 GRASSES

(*See also* Abs. No. 932)

[984] 633.2/3-1.81 : 581.192
SWIFT, R. W.; JAMES, W. H.; MARCY, L. F., ET AL. **Monthly yields and composition of herbage composed of Kentucky bluegrass, *Poa pratensis* L., and white clover, *Trifolium repens* L., as affected by fertilizer treatments.** *J. Amer. Soc. Agron.* 40, 1948 (1051-1060). [Pa. Agric. Expt. Sta.]

The highest content (73.7%) of bluegrass was found on the plot which had received NK treatment, the fertilizer treatments increasing the bluegrass content at the expense of the clover. The composition of the dry matter of bluegrass and clover varied with the season. A mid-season application of N exerted a definitely favourable effect in increasing the nutritive value of the harvested forage. The fertilizer treatments did not cause appreciable variation in the crude fibre content.

[985] 633.2.03 : 551.48
HICKOK, R. B. **Runoff losses from permanent pastures and woodlots.** *Agric. Engng.* 30, 1949 (80).

Permanent pasture and woodlots reduce the frequency of high rates of run-off, but may not reduce the total seasonal run-off. In 1947 from 6 rotation-cropped catchments, 2 each in maize, wheat and soybeans, on well-drained prairie soil the average annual run-off was 6% of the total rainfall; from cropped catchments under conservation treatments the run-off was under 2% and from 2 permanent-pasture catchments it was just over 6%. On permanent-pasture catchments with slower-draining, upland soils loss was 12%. An adjacent catchment which had been open to stock lost over 14% and one protected from stock since 1939 and with much more leaf litter and undergrowth lost 24%.

[986] 633.2.03-1.67 ; 581.192
VIEITEZ, E.; DIOS, R. Influencia del riego intensivo sobre la composicion quimica del Holcus lanatus, Lolium multiflorum y Poa annua. **[The effect of intensive irrigation on the chemical composition of *Holcus lanatus*, *Lolium multiflorum* and *Poa annua*.]** *An. Inst. Esp. Edafol.* 7, 1948 (315-342). [Sp.]

Analyses are presented of the contents of protein, cellulose, fats, total ashes, etc., of grass samples collected about once a month from one unirrigated and one constantly irrigated meadow. The constant irrigation, which produced material of less nutritive value and also encouraged to some extent the invasion of species unsuitable for forage, should be replaced by less intensive watering.

[987] 633.2.03-1.81
VOGLER, E. Fumure minérale et rendement des prairies. **[Mineral fertilizer and yields of grassland.]** *Potasse* 22, 1948 (165-167; 204-205). [F.]

The results of investigations by S. Gericke, and published in *Deut. Landw.* January, 1948, are summarized in detail. Yields can be increased substantially by organic and inorganic fertilizers.

[988] 633.2.03-1.84 : 581.192
HOLMES, W. **The intensive production of herbage for crop-drying. I. A study of the productivity of two annual crops and two leys and of their responses in yield and chemical composition to applications of nitrogenous manure.** *J. Agric. Sci.* 38, 1948 (425-436). [Hannah Dairy Res. Inst.]

A two-year experiment was laid out on land which had been ploughed out of a short ley and treated with $CaCO_3$, super., KCl and nitrochalk before sowing annual crops of vetches and barley, and ryegrass- and cocksfoot-dominant leys. Nitrochalk at a rate of 3½ cwt./acre was applied to all except the control plots, in one, 2 or 3 dressings. The leys were superior to the annual crops both in the yields of dry matter and crude protein produced in response to N manuring, and in the length of their productive season. Yields of all crops and the crude-protein content of barley and vetches were increased by treatment with N, especially where 1½ cwt. was applied when the crop was established followed by 2 cwt. in late June. Earliest cuts were obtained from the plots receiving the heaviest spring dressings. Recovery of N was higher in the drier year and was more efficient by the leys than by the annuals.

[989] 633.2.03-1.85
STALÉ, J. Résultats d'expérimentation de différents types de fumures phosphatées sur prairies. **[Results with different types of phosphate fertilizers on meadows.]** Repr. *Landw. Vortr.* 15, 1948, pp. 16. [F.] [Fed. Expt. Sta., Lausanne]

In soils of pH 6 or less, basic slag and bone meal gave results at least equal to super. when the materials were applied once in several years. Tunisian rock phosphate, when finely ground, was little inferior to the other fertilizers. In calcareous soils, water-soluble phosphates gave considerably larger yields than the other types. The effects on the mineral and botanical composition of the herbage are noted.

[990] 633.283-1.5
COETZEE, P. J. S. **The Pennisetum grasses.** *Farm. S. Africa* 23, 1948 (811-814). [Coll. Agric., Cedara]

633.3 LEGUMES

[991] 633.3-1.453 : 546.711
MORRIS, H. D. **Soluble manganese as a factor affecting the growth of various legumes in culture solutions and in acid soils.** Abs. in *Iowa St. Coll. J. Sci.* 23, 1948 (55-56).

Concentrations of Mn injurious to various legumes ranged from 1 to 10 p.p.m. and the decreasing order of sensitivity was lespedeza, sweet clover, soybean and cowpeas, and peanuts. Concentrations of exchangeable Mn in 25 acid soils varied from 1 to 638 p.p.m. and water-soluble Mn in 1 : 2 soil-water extracts ranged from 0 to 6.3 p.p.m. on an oven-dry basis, the concentration in the most acid soils being considerably higher than that in the less acid soils. Toxicity symptoms were seen when sweet clover or lespedeza contained more than 400 p.p.m. of Mn and reductions in yield were proportional to the concentration of Mn in the plants. Plants on acid soils containing high amounts of water-soluble Mn benefited from applications of $CaCO_3$, due to reduction of soluble Mn in the soil by an increase in pH. There was no benefit from $CaCO_3$ on acid soils low in water-soluble Mn. Applications of $CaSO_4$ to acid soils were detrimental because of the increased water-soluble Mn in the soil and increase in soil acidity. Applications of P_2O_5 as high as 1500 lb./acre did not reduce toxicity. Increases in yield from high pH treatments were due to the additional P supplied and not to any decrease in the water-soluble Mn content of the soil.

[992] 633.3-2.191 : 546.711
EVANS, H. J.; PURVIS, E. R. **An instance of manganese deficiency of alfalfa and red clover in New Jersey.** *J. Amer. Soc. Agron.* 104, 1948 (1046-1047). [N.J. Agric. Expt. Sta., New Brunswick]

Alfalfa and red clover are generally considered to be capable of obtaining from well-limed soils the small amount of Mn required for normal growth. Poor growth and chlorosis in a 2-year-old stand of alfalfa and red clover on heavily-limed sandy loam of pH 7.2 was improved by treatment with 50 lb./acre of $MnSO_4$. After harvest, plants which received $MnSO_4$ gave a dry-weight yield of 1531 lb./acre compared with 818 lb. from untreated plots. The symptoms were due

to Fe toxicity, and recovery resulted when the Fe/Mn ratio was lowered. A high content of Mg and K in untreated plants is probably due to accumulation of those nutrients because of retarded growth.

[993] 633.31-1.416.7/8 : 581.192
HUNTER, A. S. **Yield and composition of alfalfa as affected by variations in the calcium-magnesium ratio in the soil.** *Soil Sci.* 67, 1949 (53-62). [U.S.D.A. Ithaca, N.Y.]

Lucerne was grown in pots containing soil which was uniform in amount, pH and nutrients other than Ca and Mg ; the Ca : Mg ratio varied from 1 : 4 to 32 : 1. The soils were prepared from sand and H-clay by combining homionically saturated soils in appropriate proportions or by mixing suitable amounts of carbonates and bicarbonates with the acid soil. Lucerne yields were unaffected by the Ca : Mg ratio, but were lower in soils of the carbonate series in the case of the first crop. Yields were higher and the P content of the crop increased by 30% in a second series where a higher level of P was used. The P, Mg, K and N contents of the lucerne decreased and the percentage of Ca increased as the Ca : Mg ratio rose. The sum of the cation equivalents remained constant for all ratios ; lignin content was also unaffected. Compared with those of the carbonate series, soils of the adsorbed series produced higher yields with the lower percentages of P and N, and with the higher percentages of Ca and K, but the only significant interaction between method of soil preparation and either of the other two variables was the interaction with P level upon the yield of the first crop.

[994] 633.33-2.191 : 546.22
IVANOFF, S. S. **Chlorosis and nodulation of cow-peas as affected by trial sulphur applications to calcareous soil in the greenhouse.** *Plant Physiol.* 23, 1948 (162-164). [Texas Agric. Expt. Sta., Winter Haven]

Highly calcareous soils in south Texas are unfavourable for cowpeas and other legumes because of lime-induced chlorosis. Chlorosis was least on plants growing on soil receiving 6 lb. of S per 10 square feet area and 12 inches deep. With 2 lb. of S a few plants showed slight chlorosis. The greenest plants had the largest and most nodules. It is not known whether nodulation was increased by the direct effect of the S on the rhizobia and their environment or by the better growth of the plants induced by some minor elements through the action of S. The beneficial effect of S lasted at least 5 years.

[995] 633.34-1.5
NYASALAND AGRICULTURAL QUARTERLY JOURNAL. **Soybeans.** *Nyasaland Agric. Quart. J.* 7, 1948 (93-101).

[996] 633.366-1.83 : 581.192
ALBRECHT, W. A.; KLEMME, A. W.; MIERKE, W. **Potassium helps put more nitrogen into sweetclover.** *J. Amer. Soc. Agron.* 40, 1948 (1106-1109).

After applications of K + lime + P, roots were more efficient in making plant tops and in increasing their N content than they were after lime alone or lime + P.

[997] 633.377-1.544.7
WHITE, D. G.; PAGAN, C.; MANGUAL, J. C. **The effects of mulching *Derris elliptica*.** *Trop. Agric. Trin.* 24, 1947 (131-136). [U.S.D.A., Mayaguez, Puerto Rico]

Mulching increased soil moisture, decreased soil temperatures and reduced weeds. Yield of roots from *Derris* mulched with sugar-cane or lemon-grass leaves was significantly higher than from unmulched plots. The rotenone content of the roots was not affected adversely and in some instances was higher on mulched than on unmulched plots. 86% of unrooted cuttings placed under mulch had developed into healthy plants after one year.

633.4 ROOT CROPS

[998] 633.4-1.81
GARNER, H. V. **Nutrition of farm crops. V. Manuring of root crops. Mangolds, swedes and turnips.** *Farming* 3, 1949 (76-80). [Rothamsted]

The article is based on results of manuring experiments carried out during the last 50 years.

633.491 POTATOES

(*See also* Abs. No. 1133)

[999] 633.491-1.411.4
TKACHENKO, P. I. **The effect of peat soils on the seed qualities of potatoes.]** *Sad i Ogorod* No. 1, 1949 (79-80). [R.]

Higher yields were obtained with potatoes grown on peat soils than with those grown on mineral soils. The potatoes grown on peat soils were less susceptible to disease.

[1000] 633.491-1.61
ELLISON, W. **Potato experiments on reclaimed virgin land.** *Farming* 3, 1949 (52-55)

[1001] 633.491-1.81
MATTINGLEY, G. H. **The potato crop. Seed, planting, cultivation.** *J. Dept. Agric. Victoria* 46, 1948 (529-535).

P as super. and N as $(NH_4)_2SO_4$ are the best for potatoes, and where K is needed, the sulphate is recommended. The rates of application for the various potato-growing soils are given. The most beneficial placement is in bands 2 inches away on each side of the seed pieces.

[1002] 633.491-1.84 : 581.192
KOBLET, R. Untersuchungen über den Einfluss der Stickstoffdüngung auf den Krankheits-befall und die Speisequalität der Kartoffel. II. [**Studies on the influence of nitrogen fertilizing on the incidence of disease and the eating quality of potatoes. II.**] *Landw. Jahrb. Schweiz* 62, 1948 (827-847). [G.f.]

Increasing applications of N as nitro-chalk to potatoes receiving K, P and manure in most cases caused some increase in the N content of the tubers, but were not correlated with variations in the K, P and ash contents.

[1003] 633.491-2.2
PETERS, B. G. **The potato root eelworm problem.** *Agriculture* 55, 1948 (493-498). [Rothamsted]

[1004] 633.492-1.84
EDMOND, J. B.; ANDERSON, W. S. BOSWELL, V. R. **Cooperative studies of sweet-potato-plant production.** *U.S.D.A. Circ.* 787, 1948, pp. 17.

The effects of N supply, time of harvest, and curing and storage of roots on the plant production of two types of sweet potato were studied on loam in Mississippi and sandy loam in S. Carolina. Two rates of N were compared: 80 and 0, and 100 and 20 lb./acre on the loam, and 40 and 10 lb./acre on the sandy loam. The means of plants produced at both levels were statistically identical, but, in the Mississippi tests, roots from the high-N plots were more productive than those from low-N ones when stored without heat. The opposite was true for roots from heated storage.

633.5 FIBRE PLANTS

(*See also* Abs. Nos. 877, 1113)

[1005] 633.51-1.3
SMITH, H. P.; JONES, D. L. **Mechanized production of cotton in Texas.** *Tex. Agric. Expt. Sta. Bull.* 704, 1948, pp. 62.

[1006] 633.51-2.191-1.811.1
DASTUR, R. H.; SINGH, K. **Investigations on the red leaf disease in American cottons. I. Red leaf disease in Sind—Americans cottons in Sind.** *Indian J. Agric. Sci.* 17, 1947 (235-244). [Indian Centr. Cotton Ctee., Bombay]

Two types of red-leaf disease of cotton have been distinguished. The yellow-red type was associated with sandy soils and the green-red type with clays. In experiments on light sandy soils to which $(NH_4)_2SO_4$ was applied and where the sowing date was varied, yellow-red leaf was checked and yields were increased by the fertilizer. The concentraton of N in the leaves of manured plants was higher than in the leaves from control plots. Early-sown plants were more susceptible to the disease than the late sown, and it is suggested that the more widespread occurrence of the yellow-red leaf in south Sind than in middle Sind and the Punjab may be ascribed to a combination of soil and climatic factors. In south Sind climatic conditions favour the early initiation of flowering and boll development. This rapid maturation of the crop causes heavy depletion of N from the leaves, which become senescent.

[1007] 633.51-2.4-1.4
MOUREAU, J. Le sol et sa protection dans le cadre de la lutte contre le "wilt" du cotonnier. **[The soil and its protection in relation to the control of cotton wilt.]** *C.R. Sem. Agric., Yangambi* 1947 (82-87). [F.] [I.N.E.A.C.]

The effect of soil pH, temperature, humidity, and chemical and physical characteristics on the relationship between the cotton plant and *Fusarium vasinfectum* is discussed. Generally, the conditions which favour the fungus are also those which are required for normal development of the plant. Since 1941 the prevalence of wilt under fallows of *Pennisetum purpureum* and under forest have been studied.

[1008] 633.51-2.4-1.582 : 633.366
LYLE, E. W.; DUNLAP, A. A.; HILL, H. O. ET AL. **Control of cotton root rot by sweetclover in rotation.** *Tex. Agric. Expt. Sta. Bull.* 699, 1948, pp.21.

When sweetclover was ploughed under in early spring and followed by cotton the same year, cotton root rot was delayed and decreased and yield was increased. Cotton yields were highest after crops of hubam (*Melilotus alba* var. *annua*) were grown to maturity in the previous year and ploughed in. The ploughing in of hubam every third or fourth year gave the best results.

[1009] 633.52-2.19 : 546.711 : 546.77
MILLIKAN, C. R. **Lower leaf scorch of flax.** *J. Dept. Agric. Victoria* 46, 1948 (511-517, 566-576) ; 47, 1949 (37-41).

Pot and field experiments have shown lower-leaf scorch of flax to be primarily due to the combined effects of Mn toxicity and Mo deficiency, both being induced by highly acid soil conditions. The existence of a Mo-Mn antagonism in the plant is confirmed. Applications of lime greatly reduced the incidence of lower-leaf scorch and steam sterilization increased it, due to the increased Mn concentration in sterilized soil.

[1010] 633.524.1-1.5
DU TOIT, J. J. **The production and uses of sunnhemp.** *Farm. S. Africa* 23, 1948 (819-822). [Coll. Agric., Potchefstroom]

Sunnhemp (*Crotalaria juncea*) is very drought resistant and succeeds under dryland conditions in most areas receiving 20 inches or more of rain per annum. When grown for fibre it requires a light, not very rich soil ; the quality of the fibre deteriorates on rich soils. When grown in rotation with maize or other crops, 200-400 lb./morgen of super. applied to the preceding crop benefit the sunnhemp. When grown for green manure, the fertilizer should be applied to the sunnhemp. If the soil is moist when the crop is ploughed under, the vegetation should be rotted down in 5-6 weeks.

633.6 SUGAR CROPS

(*See also* Abs. Nos. 811, 925, 1155)

[1011] 633.61-1.81
SHERRARD, C. D. **A summary of results of manurial trials in the sugar belt.** *Proc. Ann. Cong. S. Afric. Sug. Tech. Assoc.* 22, 1948 (119-126).

The greatest response to P and to N may be expected on sandy soil types. Sandy loams and clay loams of the alluvial flats did not respond to P. Soils which had not previously been under cane gave a big response to P. Super. was the most economical form of P to use, 500-800 lb./acre in the furrow at planting time giving the best results. Only as a top-dressing to plant or ratoon cane could responses be obtained with N, 300-400 lb./acre of $NaNO_3$ or $(NH_4)_2SO_4$ being the usual dressing. After green manure N produced no response. No response was obtained with K. Splitting the N applications was of no advantage. Straight fertilizers were better than mixtures.

[1012] 633.61-1.84
CARRERAS, J. G. **[Fertilization of sugar-cane.]** *Agronomia* 12, No. 52, 1947 (13-48). C.A. 43 (341).

Experimental results show that increases of yield produced on 1 hectare of land by 100 kg. of N fertilizer are in inverse proportion to the percentage of N normally contained in the mill cane plus tops and leaves. Other things being equal, to produce equal tonnages from the same soil the additions of N fertilizer should be in direct proportion to the normal N contents of the varieties.

[1013] 633.61-2.4 : 576.809.7
COOPER, W. E.; CHILTON, S. J. P. **Antibiosis and sugarcane root rot.** Abs. in *Phytopath.* 38, 1948 (6).

During the past 2 years, 6500 isolates of *Actinomyces* were obtained from Louisiana sugar-cane soils. Silt loams contained the greatest number of *Actinomyces* antibiotic to *Pythium arrhenomanes* which causes root rot of sugar cane, and clays contained the least number. Yield tests with sugar cane gave yields correlating with the number of antibiotic *Actinomyces*. In greenhouse tests in sterile soil certain *Actinomyces* increased in the soil and reduced root rot in maize; other strains failed to increase in the soil.

[1014] 633.63-1.3
DECOUX, L. La méchanisation de la culture de la betterave. [**The mechanization of sugar-beet cultivation.**] *Inst. Belge Amélior. Better. Pub.* 16, 1948 (103-165). [F.fl.e.]

A discussion of the 1946 and 1947 studies by the Sugar Beet Institute. The simplest solution of the mechanization of the harvest will probably be found in separating the operations of topping and harvesting, each being done by a single machine.

[1015] 633.63-1.51
DECOUX, L. L'évolution de la méthode de préparation superficielle du sol, en relation avec le semis précoce. [**The development of the method of shallow preparation of the soil in relation to early sowing.**] *Inst. Belge Amélior. Better. Pub.* 16, 1948 (83-101). [F.fl.e.]

The method is described in *Soils and Fert.* 11 [985].

[1016] 633.63-1.531-1.84
STUMPEL, J. M. H. Proefvelden met twee objectenreeksen. 1943. [**Double-treatment field trials. 1943.**] *Meded. Inst. Ration. Suikerprod. 1946,* 16, 1948 (193-217). [Du.e.f.]

In trials in which sugar beet was sown at 4 different dates root yields and sugar content decreased with delay in sowing. In another experiment the weights of root and sugar from 2 varieties increased with planting density, but in a third, larger-rooted, variety yields were higher at the lower densities. Where lime-saltpetre was applied at rates varying from 40 to 180 kg. of N per ha. yields of tops and roots increased with heavier applications; sugar yields were constant for applications above 60 kg.

[1017] 633.63-1.81
GARNER, H. V. **The manuring of root crops. 1. Sugar beet.** *Farming* 3, 1949 (36-40).

Information accumulated over the past 16 years is summarized. The importance of correct soil reaction is emphasized; pH values of more than 6 are considered safe. Figures are given for the effect of farmyard manure on yields.

633.7 STIMULANTS

[1018] 633.71-1.5
MCMURTREY, J. E. **Growing better tobacco.** *Econ. Bot.* 2, 1948 (326-332). [U.S.D.A., Beltsville]

Literature on tobacco cultivation, including cropping systems and fertilizer practices, is reviewed.

[1019] 633.71-1.582
QUEENSLAND DEPARTMENT OF AGRICULTURE. **Field trials. Tobacco.** *Queensland Dept. Agric. Rept. 1947-48,* 1948 (19).

Tobacco following 1 or 2 years of Rhodes grass or 1 year of *Crotalaria goriensis* yields almost as well as on virgin soils. After two years of *Crotalaria* the yield of cured tobacco approached 1000 lb./acre which is as good as that obtained from virgin soils.

[1020] 633.71-1.81
GEORGIA COASTAL PLAIN EXPERIMENT STATION. **Fertilizing flue-cured tobacco.** *Ga. Coast. Pl. Expt. Sta. Mimeo. Paper* 16, 1948, pp. 2.

On average Georgia soils, 1000-1200 lb./acre of 3-9-9 fertilizer are sufficient for flue-cured tobacco; Cl, Mg, Ca and S are also essential for high yields and good leaf quality. Seedlings should not be transplanted directly into or immediately above a band of fertilizer, but the fertilizer should be placed in bands 3-4 inches to the side of the row or should be mixed with the soil before listing. Not more than 1000 lb. should be applied in the row before planting and the rest as a side-dressing at the first cultivation or not later than 20 days after transplanting. Where additional N is necessary it should be applied with K and should not exceed 15 lb./acre. Not less than $\frac{1}{5}$ of the N should be derived from high-grade organic sources such as cottonseed meal, not less than $\frac{1}{5}$ from

nitrates and the rest from other inorganic materials. High amounts of water-soluble N in dry seasons delay development and decrease quality. Readily available sources may leach out in wet weather.

In the K fertilizer, mixtures of muriate, K_2SO_4 and K_2SO_4+MgO are recommended. More than 2% of Cl in most soils reduces the fire-holding capacity of the cured leaf. Wherever side-dressings are required, K_2SO_4 is recommended. Mg may be supplied in K_2SO_4+MgO or as dolomite.

For seedbeds 1 lb./sq.yard of a 4-9-3 or 3-9-6 fertilizer should be worked into the soil over 2 inches deep a few days before sowing. Where cyanamide has been used ½ lb. of fertilizer is sufficient. Most of the N should be slowly available, but excessive amounts of organic materials should be avoided. ¼ of the N should be organic, ¼ from nitrates and ½ from other inorganic fertilizers. K fertilizers should contain no Cl. The fertilizer should carry 1% of MgO.

[1021] 633.71-1.841.1
VOLODARSKY, N. I. **[The effect of nitrogen nutrition on the quality and yield of tobacco.]** *Dokl. Akad. Nauk S.S.S.R.* 60, 1948 (845-847). C.A. 43 (1082).

With the addition of increasing amounts of $(NH_4)_2SO_4$ the thickness of the leaves increased and the yield of upper leaves was improved by increasing the area of the leaves and not the total number of leaves.

[1022] 633.71-2.4-2.953
STEINBERG, R. A.; CLAYTON, E. E. **Chemical soil treatment for black root rot of tobacco in the greenhouse.** *Phytopath.* 39, 1949 (155-157). [Plant Indust. Sta., Beltsville, Md.]

Tests were made with chemicals of which urea, sodium azide, hexamethylenetetramine and sodium nitrite were most promising. A list is given of the compounds found to be unsatisfactory for partial soil sterilization. Urea at 6 g./crock (½ lb./square yard) gave satisfactory protection with first-crop seedlings. Sodium nitrite was more effective on replanting, but was somewhat toxic to seedlings unless leached from the soil with water. Hexamethylenetetramine gave some control at 9 g./crock, but it was more toxic than urea to the tobacco and first-crop seedlings were stunted or killed. Adequate leaching is desirable. 0.5-1.0 g./crock of sodium azide gave good root-rot control with the first and second crop of seedlings, but without leaching first-crop plants were killed. With leaching, 1 g./crock controlled the disease, but the growth of tobacco was retarded. Sodium azide is poisonous to animals and forms explosive compounds with metals such as copper. Urea is the least expensive and is valuable as a source of N. Mixtures of urea with sodium azide, hexamethylenetetramine and dichloramin T gave no synergistic effects.

[1023] 633.73-1.81
MAYNE, W. W. **A note on coffee research in South India.** *Indian Coffee Bd., Bangalore,* 1946, pp. 72.

The problem of manuring coffee can only be approached by planting trees to fit an experimental design and not by imposing a design on established coffee. Fertilizers may have quite different effects in the early years from those during productive years, and a series of manuring experiments should be set up from the first year of planting until full bearing is reached.

[1024] 633.73-1.875
PERMANNE, R. L. Note sur le compostage des caféiers. **[A note on composts for coffee plantations.]** *C.R. Sem. Agric. Yangambi* 1, 1947 (424-426). [F.]

Economics of composting on coffee plantations.

[1025] 633.74-1.58
THIRION, F. Le cacaoyer, quelques modes de cultures expérimentés à Yangambi. **[Cacao, some cultivation methods tried out at Yangambi.]** *C.R. Sem. Agric. Yangambi* 1, 1947 (427-431). [F.] [Coffee and Cacao Div.]

The three methods tried were: (1) growing cacao under forest cover, (2) planting out after burning, and (3) without burning. Growing cacao under forest cover is easy to carry out and is rapid both in operation and economic returns. It is necessary, however, to keep only the forest species unlikely to interfere too much with the development of the cacao. The non-burning method appears the best for providing cacao with the optimum conditions of growth, including well protected soil, abundant reserves of organic matter and shade whose intensity can be easily regulated. Minor inconveniences are the greater difficulty of planting out, higher acidity and lower density of cacao planting. The method of burning the forest cover is only admissible on soils which are sufficiently rich to stand it without ultimate deterioration of the cacao.

[1026] 633.74-1.86/7
HACQUART, A. Quelques observations sur les plantations de cacaoyers au Mayumbe. **[Some observations on cacao plantations in Mayumbe.]** *C.R. Sem. Agric. Yangambi* 1, 1947 (463-468). [F.]

Reference is made to a paper by de Bellefroid (*Bull. Agric. Congo Belge* 37, 1946, pp. 554-584) who concluded that under the conditions of his experiments manuring was not profitable as the cacao trees were more in need of a good water supply than of nutrients. Under the conditions prevailing at Mayumbe, where irrigation is out of the question, the only method available is to use organic manures such as compost, in order to build up hydrologic reserves and supply the cacao trees with nutrients at the same time, and in this way to build up their resistance to *Sahlbergella*.

[1027] 633.79-2.4-1.4
KEYWORTH, W. G. **Verticillium wilt of the hop (*Humulus lupulus*). IV. Study of a fluctuating outbreak.** *J. Hort. Sci.* 24, 1948 (149-156). [E. Malling Res. Sta.]

Localization of plants showing symptoms of the disease is probably due to environment, but no evidence could be obtained of any correlation with soil conditions.

633.8 AROMATIC, MEDICINAL AND OIL PLANTS

(*See also* Abs. Nos. 946, 1128)

[1028] 633.841-2.4-1,582
CHOWDHURY, S. **On the control of rhizoctonia root-rot of pan (*Piper betle L.*).** *Science and Culture* 13, 1948 (507-508). R.A.M. 28 (82).

Continuous cropping with *Imperata arundinacea* for 4 years eliminated the infection during the following 3 years. After 4 years' continuous cropping with rice, potato and jute, tobacco and sunnhemp, and *P. betle*, percentages of mortality of *P. betle* from *Rhizoctonia solani* were 4.2, 6.7 and 5.0; 8.6, 12.5 and 9.7; 3.2, 4.0 and 4.2; and 18.7, 20.5 and 24.5 in the 3 years respectively.

[1029] 633.842-2.4-1.462
BAKER, K. F. **Disease-free seedlings.** *Flor. Rev.* 102, No. 2627, 1948 (31-32). R.A.M. 28 (110-111).

Mechanized production techniques, involving the elimination of fungal diseases, in commercial pepper-seedling nurseries include mechanical flat fillers which receive, by conveyor belts, the various soil components ready mixed, steel rollers to convey the pasteurized flats into greenhouses, and a vacuum-plate seed-sowing machine. The seedlings may be safely grown in greenhouses with high temperatures and humidity and high levels of soil moisture and fertility.

[1030] 633.852.52-1.461.52-2.953
MILLER, L. I. **Root nodulation of Holland Jumbo strain peanut grown from seed treated with a fungicide.** Abs. in *Phytopath.* 38, 1948 (18).

Spergon applied at 3 ounces/100 lb. of shelled seeds had no effect on nodulation in non-sterilized or in steam-sterilized soil. The root system in steam-sterilized soil was larger than in non-sterilized soil. Nodules appeared in plants in both soils without inoculation, but nodules on plants from non-inoculated seed were larger and fewer than on plants from inoculated seed.

[1031] 633.852.52-1.5
FARMER'S WEEKLY. **Little-known indigenous legume. Bambarra groundnut or njugo bean a nutritious and potential source of oil.** *Farm. Week. S. Africa* 76, Feb. 2, 1949 (51).

The Bambarra groundnut (*Voandzeia subterranea*) or pistachio nut is grown in native reserves in the northern Transvaal, Natal and Swaziland. It is drought-resistant, does well in sandy and sandy-loam soils containing a fair amount of lime and organic matter and the shelled beans can be stored for much longer periods than groundnuts. It is often planted mixed with maize.

[1032] 633.852.52-1.811.4 : 581.192
REED, J. F.; BRADY, N. C. **Time and method of supplying calcium as factors affecting production of peanuts.** *J. Amer. Soc. Agron.* 40, 1948 (980-996). [N.C. St. Coll., Raleigh]

The Ca supply in the soil is the most important single factor in the production of large-seeded peanuts. On soils of low Ca level, broadcast applications of dolomitic limestone increased the size of the plant, the number of gynophores and the percentage of cavities filled. Applications of gypsum increased the percentage fill of cavities. Broadcast applications of limestone were

generally less effective the second year after application than gypsum applied each year. Broadcast applications of limestone resulted in a decrease in K content of the plant, but localized placement of gypsum gave an increase in Ca, Mg and K in the plant.

[1033] 633.854.56-1.544.7
PAINTER, J. H. **Mulching young tung trees pays dividends.** *Proc. Amer. Tung Oil Assoc.* 1947 (36-41). Biol. Abs. 22 (2545).

Cover crops or weeds and grass provide excellent mulching material.

[1034] 633.855.34-1.5
FERRAND, M. Fumure chimique et entretien de la fertilité des sols dans les plantations de palmier à huile. [**Chemical fertilizing and the maintenance of soil fertility in oil-palm plantations.**] *Oléagineux* 1947 (617-629). Agron .Trop. 3 (538).

The differences in fertilizer response between the oil palms of Sumatra and those of central Africa lie in the absorption capacity of the mineral-colloid complex of the soils. In the Far East montmorillonite and micas occur most frequently while in Equatorial Africa the clay fraction belongs mostly to the kaolinite series.

The maintenance and improvement of soil fertility in African oil-palm plantations is discussed. In tropical soils, the re-establishment of forest is considered preferable to a legume cover as a method of maintaining the humus content.

[1035] 633.887.791-1.58
ENGELBEEN, M. La culture du pyrèthre et la conservation du sol. [**Pyrethrum cultivation and soil conservation.**] *C R. Sem. Agric. Yangambi* 1, 1947 (74-82). [F.] [I.N.E.A.C.]

Pyrethrum is a plant which is unable to withstand competition from other plants and for this reason its cultivation encourages leaching of nutrient elements and drying out of the soil. Soil-conservation measures should be taken at the very start when the bush is being cleared. It is suggested that clearing the bush in alternate strips and not burning it might be a practical method of protecting the soil and effecting the necessary clearance. Further measures should be suitable rotations with the inclusion of a shrub fallow.

634 ORCHARDS. FRUIT
(*See also* Abs. Nos. 963, 1151)

[1036] 634.11-2.191-1.811.1
GUYON, G. Sur le dépérissement du pommier de pré-verger dans le Massif Central. [**Progressive enfeeblement of apple trees in meadow orchards in the Massif Central.**] *Ann. Agron.* 18, 1948 (593-606). [F.]

The condition is due to N deficiency brought about by the growth of the herbaceous cover. Affected adult trees should receive on the average 4-6 kg. of $(NH_4)_2SO_4$ over 2 or 3 years, applications being made 3 times between February and July by fertilizer lance or through several holes in the ground or in 15-cm. trenches of area 3-4 square metres situated in the lines of the trees and kept full to the soil surface with peat or manure, thus allowing mechanical mowing.

[1037] 634.21-2.4 : 635.64
RENOUF, L. R. **Verticillium wilt of apricots.** *N.Z. J. Agric.* 77, 1948 (284).

Apricot trees have been attacked by *Verticillium dahliae* when grown in ground previously cropped to tomatoes. The disease cannot be eradicated and infected trees should be removed and the land left fallow or replanted with trees other than apricots.

[1038] 634.23-2.4-1.432.2
GRASSO, V. Alcune delle cause del deperimento del ciliegio in Italia. [**Some causes of cherry wilt in Italy.**] *Nuovo G. Bot. Ital.* 55, 1948 (1-34). R.A.M. 28 (68). [I.f.]

The disease is probably due to excessive heat or cold and insufficient soil moisture. P and K fertilizers should be applied. New plantings should not be made on compact soils.

[1039] 634.25-2-1.432
FIKRY, A. **Water-table effects. V. Peach functional disorder.** *Egypt Min. Agric. Plant Path. Sect. Bull.* 245, 1947, pp. 42.

The disorder is due to the asphyxiation and disintegration of roots caused by seasonal rise in the ground-water level even in the absence of harmful salts. Peaches in Egypt should be grown on higher land with a low water table. Pruning and watering at the critical period of the Nile rise failed to save the trees. Drainage to lower the water table might be of benefit.

[1040] 634.3-1.81
VAN NIEKERK, O. T. **Fertilizing of citrus orchards.** *Citrus Grow.* 169, 1948 (7-12). Biol. Abs. 22 (2545).

The general problem of soils and fertilizers is discussed. The soils of the Eastern Transvaal are acid. N and, in most instances, P are recommended and organic manures and cover crops are useful. K is not needed, but Zn and Mg and lime should be applied at regular intervals.

[1041] 634.3-1.84 : 581.192
VAN DER MERWE, A. J. **Absorption of phosphorus by citrus trees. Effect of ammonium and nitrate nitrogen.** *Farm. S. Africa* 23, 1948 (669-674). [Div. Hort., Pretoria]

The total-N content of fruit and leaves was higher and the total-P content lower, and the N/P ratios in juice, pulp, rind and leaves were higher in trees receiving N in the ammonium form than in the nitrate form.

[1042] 634.37-2-1.5
DU PREEZ, D. **The dropping of immature figs.** *Farm. S. Africa* 23, 1948 (817-818, 822, 830). [Fruit Res. Sta., Stellenbosch]

The common fig tree has a shallow root system. Land should be cultivated as little as possible and irrigated frequently and thoroughly. Fruit setting is affected by lack of N. Stable manure should be applied early and worked in shallowly.

[1043] 634.42-1.5
RUEHLE, G. D. **The common guava—a neglected fruit with a promising future.** *Econ. Bot.* 2, 1948 (306-325). [Fla. Agric. Expt. Sta.]

The common guava thrives on various soil types with pH values ranging from 4.5 to 8.2. Heavy crops are produced in Florida where the annual rainfall varies from 45 to 70 inches, but heavy rains at fruit-setting and ripening are undesirable. Indications are that in heavily fertilized commercial orchards trees should not be planted closer than 20 feet in rows 20 to 25 feet apart. The land should be cleared and well cultivated some months before planting, and on newly cleared sandy soils with low pH and low Ca and Mg levels, a general application of dolomite is desirable. On limestone soils 600 lb. of super./acre should be disced in just before or after planting. Guava trees respond to fertilization, and a complete fertilizer should be applied every 4-6 weeks the first year, and every 60 days the second year. Symptoms of Zn, Cu, Mg and Mn deficiencies may occur, and can be corrected by foliage sprays. Cover-cropping with native grasses or weeds is a satisfactory practice, but deep cultivation should be avoided.

[1044] 634.431-1.5
CHUN, W. Y.; BENEMERITO, A. N. **The cultivation of the Chico fruit in South China.** *Sunyatsenia* 6, 1946 (263-270). Biol. Abs. 22 (2544).

The origin of *Achras sapota*, its cultural requirements, methods of propagation, economic uses as an edible fruit and as a shade tree are described.

[1045] 634.521-1.5
MAURI, N. La culture du pacanier. [**The cultivation of pecan.**] *Serv. Agric. Gén. Algérie Bull.* 142, pp. 43. [F.]

[1046] 634.651-1.5
LOEST, F. C.; NEL, E. A. **The papaw and its cultivation.** *Farm. S. Africa* 23, 1948 (789-794, 814). [Hort. Res. Sta., Nelspruit]

[1047] 634.75-1.67-1.81
JOHANSSON, E. Gödslings- och bevattningsförsök med jordgubbar. [**Manuring and irrigation trials with strawberries.**] *Årsskr. Alnarps Lantbr. Inst.* 1948 (57-82). [Sw.e.]

An experiment at Alnarp compared 200 kg. per acre (100 sq. m.) of farmyard manure applied before planting with the same basal dressing to which various annual supplements of $(NH_4)_2SO_4$, K_2SO_4, $Ca(NO_3)_2$ and super. were added. The manure recommended on the basis of the results is 200-300 kg. of farmyard manure before planting and 1 kg. of $(NH_4)_2SO_4$, 1 kg. of super. and 0.8 kg. of K_2SO_4 per acre annually after the harvest.

In a combined manuring and irrigation experiment near Lund a significant positive effect on yield was obtained by irrigation which, however, sometimes produced a softer and later-ripening fruit than was got from unirrigated plots. Irrigation was by sprinkler, and it was assumed that the optimal water supply (including rainfall) was 70 mm. in May, 100 mm. in June and 70 mm. in July.

[1048] 634.76-1.5
EATON, E. L.; HARRISON, K. A.; MAXWELL, C. W. ET AL. **The cranberry.** *Canada Dept. Agric. Farm. Bull.* 151, 1948, pp. 35.
Preparation of bog land, weed control, flooding, fertilizing, diseases and pests are discussed.

[1049] 634.773-2.2
CARDEÑOSA BARRIGA, R. Nuevo aspecto de las investigaciones sobre la "rayadilla" del platano. [**A new aspect of the investigations on the "rayadillo" disease of plantains.**] *Notas Agronomicas Colombia* 1, 1948 (15-29). [Sp.e.] [Estac. Agric. Expt. Palmira, Colombia]
The disease resembles the infectious chlorosis of bananas. Plants in sterilized soil developed normally. Affected plants whose roots were washed with water recovered on transplanting to healthy soil. *Heterodera marioni* and *Tylenchus similis* Cobb. were found in the roots of affected plants, together with occasional specimens of other nematode species.

[1050] 634.8-2.8-1.81
GARRIGUES, E. Sur le court-noué de la vigne. [**Court-noué of vines.**] *Potasse* 23, 1949 (8). [F.]
The condition of vines on a calcareous clay soil that were severely attacked by court-noué was considerably improved by pruning and applications of sheep manure, abattoir waste and 250 g. of KCl per vine.

634.9 FORESTRY

[1051] 634.956.4-1.81 : 581.192
WILDE, S. A.; NALBANDOR, O. G.; YU, T. M. **Ash, protein, and organo-solubles of jack pine seedlings in relation to soil fertility.** *J. Forestry* 46, 1948 (829-831). [Univ. Wisc., Madison]
Fertilizer-forced seedlings had a high content of ash and protein and a low content of alcohol-benzene-soluble substances. It is suggested that this low content may be correlated with a greater susceptibility of nursery stock to attack by parasites. The contents of ash and proteins may serve as indicators of the balance of nursery-soil fertility.

[1052] 634.973.825-1.4
GRIFFITH, A. L.; GUPTA, R. S. **The determination of the characteristics of soil suitable for sal (*Shorea robusta*).** *Indian Forest Bull.* 138, 1948, pp. 27. [Dehra Dun]
Sandy loams are the most suitable for sal, best-quality sal growing in soils of this texture with boulders in the subsoil. Sal tolerates a fairly high acidity (pH 4.5-5.5 in the subsoil). The customary subsoil acidity seems to have been produced partly by the roots of the sal extracting bases from the soil. Sal litter is rich in bases, and tends to produce a slightly acidic humus.

[1053] 634.975-1.4
COLLEARY, M. J. **The durability of jack pine saplings as affected by season of cutting and subsequent conditioning and by different types of soil.** *Canada Dominion Forest Serv. Forest Prod. Lab. Mimeo. Rept.* 118, 1946, pp. 15. Biol. Abs. 22 (2551).

[1054] 634.975-1.435
MATIUK, I. S. [**The influence of soil conditions on the growth of pines.**] *Pochvovedenie* 1949 (49-53). [R.]
Pine growth was studied on sandy terraces of the river Chir in the Rostov area. The soils are described as leached chernozems formed on ancient alluvium and are largely unformed as they have been subjected to periodic deflation by wind. Some contain buried soil horizons and a compact clayey horizon. The pine stands were 16 years old.
Growth varied with the mechanical composition of the soil. Best growth was obtained on undeveloped sands with a minimum of clay in the surface horizon, but with a clayey layer at 40 to 145 cm. depth, i.e., where the main root-inhabiting layer has a fairly high water-holding capacity.

[1055] 634.975-1.44
HILL, W. W.; ARNST, A.; BOND, R. M. **Method of correlating soils with Douglas-fir site quality.** *J. Forestry* 46, 1948 (835-841). [U.S.D.A., S.C.S.]
Site quality has been correlated with soil characteristics in Lewis County, Washington and shows only slight variation on each soil unit. When the soil is known, the productivity and growth rate of Douglas fir can be safely predicted within narrow limits. The soils are grouped into 13 units according to

profile, texture, depth, underlying materials and characteristics of known importance for plant growth. Site quality was determined by the moisture relationships of the soil and the same correlations will probably not hold good over wide areas even for the same species.

635 HORTICULTURE

[1056] 635-1.811.1
SMITH, J. B.; SALOMON, M. **Optimum soil-nitrate levels for celery, carrots, spinach, onions and beets at different growth levels.** *R. I. Agric. Expt. Sta. Bull.* 300, 1947, pp. 27.

Except for onions, concentrations of less than 25 p.p.m. of nitrate N produced less than optimum yields and supplied less N than was removed by the crops. For celery, spinach and beets which give high response to N there was a high degree of correlation between yields and N applications for the entire growth period. Celery needs only 25 p.p.m. of nitrate N during the first third of the growing period and 50 p.p.m. thereafter. Beets benefit from 50 p.p.m. during the first two-thirds of the growth period and need only low concentrations thereafter; a single large application in a band at planting was the most satisfactory method. Late spinach beet grows best with 50 p.p.m. or more throughout growth. Carrots need 10-25 p.p.m. during the first third of the growth period and 25-50 p.p.m. thereafter. Sweet Spanish onions require 10-25 p.p.m. throughout growth and high concentrations may be detrimental.

[1057] 635-1.811.9
HARMER, P. M.; DAVIS, J. F. **New developments in vegetable fertilization on organic soils.** *Veg. Grow. Assoc. Am. Rept.* 1947 (197-204). Biol. Abs. 22 (2547).

Cu, Mn and Zn are usually applied as sulphates, B as borax and N as common salt.

[1058] 635.52-2.191 : 546.77
WILSON, R. D. **Some responses of lettuce to the application of molybdenum.** *J. Aust. Inst. Agric. Sci.* 14, 1948 (180-187). [Dept. Agric. N.S.W.]

The application of 0.07-0.09 g. of sodium molybdate or 0.0095-0.25 g. of ammonium molybdate per plant to stunted lettuce showing yellowing and marginal scorch of outer leaves gave better growth and darker green colour within 26-43 days. Tests with 1% diphenylamine in concentrated H_2SO_4 on the leaves of treated and untreated plants showed that the application of Mo had reduced the amount of oxidizing materials. The higher rates were no more effective than the lowest rate applied and no toxic effects were observed after the application of the highest rate.

[1059] 635.53-2.191 : 546.27
ATKINSON, J. D. **Cracked-stem of celery (*Apium graveolens* L.)** *N.Z. J. Sci. Tech.* 29A, 1948 (261-264). [Pl. Dis. Div. D.S.I.R.]

Borax at rates of 20 and 40 lb./acre was applied to a series of randomized plots on land prepared for celery. Two months later cracked-stem was prominent in all untreated plots but rare where borax had been used. Plants from the treated plots were also larger and of higher grade than those from untreated plots.

[1060] 635.64-2-1.5
SPENCER, E. L. **Blossom end rot of tomatoes as affected by soil management practices.** *Market Grow. J.* 77, No. 7, 1948 (11, 25). [Veget. Crop Lab., Bradenton, Fla.] Biol. Abs. 22 (2583).

Suggestions are: use dolomitic limestone before planting to supply adequate Ca and Mg; avoid soil types on which water regulation is difficult; balance the ratio of NO_3 and NH_3 nitrogen, especially on poorly aerated or waterlogged soils; avoid root pruning while cultivating.

[1061] 635.656-1.811.1
MULDER, E. G. **Investigations on the nitrogen nutrition of pea plants.** *Plant and Soil* 1, 1948 (179-212). [Agric. Expt. Sta., Groningen]

In field experiments with peas there was no response to combined N on soils on which growth was good. On soils where growth had been poor in previous years there was a clear response to supplied N. Plants growing in the absence of combined N were more heavily attacked by *Fusarium* sp. than those well supplied with N. In experiments on the response of pea plants to B no symptoms of B deficiency were found in the tops of plants, but N fixation was decreased and plants ripened at an earlier date and gave lower yields.

[1062] 635.964 : 553.983
DAWSON, R. B.; ESCRITT, J. R. **An investigation of the use of bitumen for soil stabilisation under turf.** *J. Bd. Greenk. Res.* 7, 1948 (148-155).

Preliminary trials show that bitumen protects the surface of established or new-sown turf. Take of bent grass and timothy was reduced, but germination of sown turf was quicker and established turf was stimulated.

GEOGRAPHICAL

(4) EUROPE

(*See also* Abs. No. 814)

[1063] (41/2)631.81 : 355.01
CROWTHER, E. M. **Fertilizer practice, 1939-1948.** *J. Inst. Corn Agric. Merchants* 1, 1948 (143-155). [Rothamsted]

Analyses of fertilizer-trials records showed that during the war, when normal supplies were cut off, it would have paid to import increased amounts of fertilizers from alternative sources, provided that they were used efficiently. Fertilizer permits were issued which were calculated from the cropping programmes of each farm to allow, firstly, for the special needs of individual crops, secondly, for the special needs of individual soils, and, thirdly, for old, ploughed-out grassland. No P or K was allowed for grassland except in the case of some dairy pastures. In spite of difficulties it was possible to treble the amount of N, double the amount of P_2O_5 and increase by one-half the amount of K_2O used in fertilizers. Although consumption of fertilizers has increased still further since the withdrawal of the permit scheme there are no grounds for fearing over-manuring of the land, and the pre-war levels of some neighbouring countries are not yet reached. Further, the fertility of grassland must be rebuilt and there is an urgent need for better grazing and more home-grown fodder. The fertilizer levels for all crops on deficient soils should be increased, if necessary at the expense of those on better land. The balance of fertilizers and farmyard manure should be improved in order to use each to the best advantage. A large proportion of the land is lime-deficient and the average rate of liming does not exceed the too-low level of 2 cwt. of CaO per acre per annum. The more general use of coarsely ground limestone rather than burnt lime is recommended. Other points discussed included the forms of fertilizer, the relative merits of purchased compounds and mixtures made on the farm, placement of super., the value of the water-solubility test for P fertilizers, and the balance between manuring arable crops and grass.

[1064] (417)631.821.1
BISHOPP, D. W. **Irish sources of lime and magnesia of high purity. Limestone, dolomite and brucite-marble.** *Eire Dept. Ind. Geol. Surv. Pamph.* 2 (*Emergency Period*) 1947, pp. 51.

[1065] (423)631.47
UNIVERSITY OF BRISTOL. **Gloucestershire, Somerset and Wiltshire, a geographical analysis.** *Univ. Bristol Reconstruction Res. Gp.* 1949, pp. 12.

Land is classified largely according to soil and site into (1) good-quality land, highly productive under efficient management and used largely for market gardens; soils are deep, mostly loams; (2) medium-quality land, usually high and steep with shallow soil and defective water conditions; of high grazing quality; (3) poor-quality land, peaty, of some value for grazing. 3 maps on a scale of 4 miles to 1 inch show land classification, topography and composite map based on a combination of the two together with features of special interest including scenery, ecology, archaeology, geology and botany.

[1066] (429)631.445.2
ROBINSON, G. W.; HUGHES, D. O.; ROBERTS, E. **Podzolic soils of Wales.** *J. Soil Sci.* 1, 1949 (50-62). [Univ. N. Wales, Bangor]

The original soils were formed under deciduous-forest vegetation. When the forests were destroyed, considerable erosion occurred, resulting in truncation of upland soils and deposition of eroded material in valleys now generally characterized by impeded drainage and peat formation. The substitution of grass for forest vegetation has led to an improvement in the organic-matter status and in soil structure. The soils are resistant to erosion and are quite stable when they are ploughed out, usually for not more than 2 or 3 years at a time.

[1067] (43)631.47
KÖHNLEIN. Gedanken über die Bewirtschaftung der Grundmoräneböden im Osten der Provinz Schleswig-Holstein. [**Thoughts on the management of the ground-moraine soils in the east of the province of Schleswig-Holstein.**] Repr. *Beitr. Agrarwissensch.* 1, 1947, pp. 16. [G.]

Between 1900 and 1941 the percentage of the agricultural land under cultivation fell from 84.2 to 66.8, and permanent pasture increased correspondingly. The numbers of livestock also increased. In order to fit in better with current (1945) economic conditions it is suggested that straw crops should be reduced from 38 to 36.2% of the arable area and grassland from 31 to 25%, and that potatoes should be increased from 2.3 to 9%.

[1068] (436)631.86
SCHOBER, K. Ein Beitrag zur Kenntnis der Düngerwirtschaft in Niederösterreich. [**A contribution to the knowledge of fertilizer economy in Lower Austria.**] *Bodenkultur* 1, 1947 (131-156). [G.]

The current and pre-war resources in litter-straw of the different areas and the net annual production of farmyard manure are estimated. Pre-war production varied from 37 to 110 dz./ha. of agricultural land and 50-140 dz./livestock unit. Production was considerably less in 1946/47. The total application of plant nutrients as manure, fertilizers and from plant sources are ascertained for the same 2 periods. Farmyard manure, besides its importance in supplying organic matter, supplied far greater quantities of NPK to the soil than did the other forms, even under pre-war conditions.

[1069] (437)63 : 551.5
NUTTONSON, M. Y. **Agricultural climatology of Czechoslovakia and its agro-climatic analogues in North America.** *Amer. Inst. Crop. Ecol. Internat. Agro-Climat. Ser.* 3, 1947, pp. 12.

[1070] (438)63 : 551.5
NUTTONSON, M. Y. **Agricultural climatology of Poland and its agro-climatic analogues in North America.** *Amer. Inst. Crop Ecol. Internat. Agro-Climat. Ser.* 2, 1947, pp. 12.

[1071] (438)631.4
STRZEMSKI, M. Gleby doliny Wisły. I. Odcinek : Kazimierz Dolny—Puławy. [**Soils of the valley of the Vistula. I. Section Kazimierz—Pulawy.**] *Ann. Univ. Mariae Curie-Sklodowska* 3E, 1948 (109-122).

[1072] (44)633.2.03
GAROLA, J.; CADIER, R. Les prairies du Thymerais. [**The grasslands of Thymerais.**] *C. R. Acad. Agric.* 34, 1948 (912-915). [F.]

From a study of the soils and herbage of the Thymerais grasslands it is concluded that drainage is the first necessity, followed by liming, harrowing and applications of P and K.

[1073] (44)634.9-1.4 : 581.5
LACHAUSSÉE, E. Les associations forestières du Jura français. [**The forest associations of the French Jura.**] *Bull. Soc. Bot. Genève 1947*, 39, 1948 (34-50). [F.] [Lons-le-Saunier]

The climate of the Jura is characterized by a uniformly distributed rainfall of 1-2 m. per annum with mean annual temperatures ranging from 10° in the west to 5° on the higher plateaux. The soils comprise red and black rendzinas and skeletal soils ; the brown soils have been cleared for cultivation or grassland. The forest soils are slightly leached and have mild humus with a neutral or alkaline reaction. Exceptions are the rapidly decalcified, flinty, Bajocien soils, certain fluvioglacial deposits and soils at an altitude of more than 1000 m. where the humus is acid and the soil slightly podzolized.

The area is discussed with reference to the geobotanical and phytosociological concepts.

[1074] (45)631.4
PRINCIPI, P. I terreni agrari della Basilicata [**The agricultural soils of Basilicata.**] *Ital. Agric.* 85, 1947 (311-319). [I.]

[1075] (45)631.4
PRINCIPI, P. I terreni agrari delle Marche. [**The agricultural soils of the Marches.**] *Ital. Agric.* 85, 1948 (45-54). [I.]

[1076] (45)631.4
PRINCIPI, P. I terreni agrari della Toscana. [**The agricultural soils of Tuscany.**] *Ital. Agric.* 85, 1948 (253-265). [I.]

[1077] (45)631.4
PRINCIPI, P. I terreni agrari della Venezia Tridentina. [**The agricultural soils of Venetia Tridentina.**] *Ital. Agric.* 86, 1949 (27-35). [I.]

[1078] (46)553.97
HOYOS DE CASTRO, A.; GONZALEZ GARCIA, F. Determinaciones analiticas en la turba de El Padul (Granada). [**Analytical determinations on peat of El Padul (Granada).**] *An. Inst. Esp. Edafol.* 7, 1948 (83-122). [Sp.e.f.]

The peat, of neutral pH, was taken from a drained and cultivated marsh lying below a deposit of good farming soil. Analyses were made of moisture, ash, H, N, P, organic content and constituents soluble in alcohol-benzene, hot water, dilute HCl and concentrated H_2SO_4.

[1079] (46)553.97
MARTIN RETORTILLO, N. Contribucion al estudio de las turbas españolas. [**A contribution to the study of Spanish peats.**] *An. Inst. Esp. Edafol.* 7, 1948 (3-81). [Sp.f.g.]

The nature and formation of (a) high and (b) low peats and of humus substances and true humus (insoluble in acetyl bromide) are briefly discussed. Analysis of several Spanish peats and peat soils showed that the characteristics of type (a) as compared with (b) included : acid reaction ; high C/N ratio ; a lower degree of decomposition as determined by acetyl bromide ; a higher cellulose content and cellulose/hemicellulose ratio ; a higher lignin content in the final residue after successive extractions with alcohol-benzene, hot water, 2% HCl and 80% H_2SO_4, the residue in (b) being almost wholly true humus. Photometrically, (a) had a much smaller stability coefficient, smaller humification and colour numbers and a higher colour quotient, indicating the absence of grey huminic acids and the presence of brown acids mixed with intermediate products such as fulvic and hymatomelanic acids. Microscopic study of thin layers showed (a) to be higher in organic matter and cellulose materials. Chromatographic and capillary analysis gave similar results to those of the photometric analysis.

[1080] (47)631.4 : 93
PRASOLOV, L. I. **Words and ideas of soil science.**] *Pochvovedenie* 1949 (38-41). [R.]

A song in praise of Russian soil scientists of which the burden is that they do not submit to, but they strive to command, the forces of nature.

[1081] (47)631.459
SMIRNOV, V. I. [**The extent of erosion in the Mari Republic.**] *Pochvovedenie* 1949 (57-59). [R.]

The republic, which is mainly on the left bank of the Volga, north of Kazan, contains some of the worst sheet and gully erosion in the U.S.S.R. An erosion map is given.

[1082] (47)631.459 : 631.61
SOBOLEV, S. S. [**Erosion control based on the grass-arable system of agriculture.**] *Pochvovedenie* 1949 (18-27). [R.]

Erosion became widespread in Russia from 1861 when the land was divided among the peasants until the socialist revolution when the introduction of collectivized agriculture based on the grass-arable system of V. R. Williams made possible a frontal attack on the problem. The most essential feature in this attack is the creation of a stable crumb structure which will permit the maximum absorption of water by soil. This can only be achieved by alternating grass-legume leys with arable agriculture ; the leys have a strong positive effect on the aggregate structure of the soil.

The establishment of forest belts in the steppes is an important feature of the national plan for combating drought and erosion. Measurements made in the Altai district have shown that a forest belt increased summer rainfall by 30-50 mm. and yields by 12-15%, as well as being very effective in preventing wind erosion. In all, 5,700,000 ha. of protective forests are planned on collective and state farms.

Stalin has ordered that the conquest of erosion must be completed in 15 years, but it is emphasized that this could not be achieved except under his leadership.

[1083] (471)631.67
WARE, M. Om bevattningsförsök i Finland. **[Irrigation experiments in Finland.]** *Nord. JordbrForsk.* 5-6, 1948 (630-634). [Sw.]

Economic results from irrigation have been obtained with clover, potatoes and roots. Hay can utilize large quantities of water, but for other crops the most efficient irrigation is one or two applications of 20-25 mm. of water in the growing season.

[1084] (477)63 : 551.5
NUTTONSON, M. Y. **Ecological crop geography of the Ukraine and the Ukrainian agro-climatic analogues in North America.** *Amer. Inst. Crop Ecol. Internat. Agro-Climat. Ser.* 1, 1947, pp. 24.

[1085] (477)631.415.3
MIRIMANYAN, K. P. **[The problem of the "light-coloured" soils of Dokuchaev.]** *Pochvovedenie* 1948 (445-447). C.A. 43 (795). [R.]

Dokuchaev's conclusion is substantiated that the high $CaCO_3$ content of 18% and the presence of soluble salts make these soils in Armenia a local type of saline soil.

[1086] (481)631.67
SORTDAL, K. K. Melding om vatningen i Norge. **[Report on irrigation in Norway.]** *Nord. JordbrForsk.* 5-6, 1948 (615-619). [N.]

Irrigation is regarded as a valuable means of increasing native food production, and especially grass, in times of crisis. There are parts of Norway where it is such an ingrained custom that the present type of agriculture would be impossible without it.

[1087] (485)631.67
HALLGREN, G. Försöksresultat och erfarenheter av bevattning i Sverige. **[Experimental results and experiences with irrigation in Sweden.]** *Nord. JordbrForsk.* 4-6, 1948 (619-630). [Sw.]

After the dry years of 1940 and 1941 numerous sprinkling-irrigation systems were installed in Sweden. In 1947 there were over 400 installations, mostly on pasture land, but also in market gardens. Experiments have shown that very considerable increases in yield (up to 86%) can be obtained by irrigation in years with dry summers, but little or no increase in wet years. The increases were comparable to those obtained from nitrogenous fertilizers, but were greatest in the absence of N. Irrigation with sewage water was successful, and there were indications that when large quantities (650 mm.) were applied there was a fertilizer as well as an irrigation effect. Irrigation with slightly saline water from Östersjö was effective in the first year, but decreasingly so in the next two years, presumably owing to the unfavourable effects of the salt on the soil's physical properties. Other experiments with a salt content of 0.7% in the water showed no unfavourable effects on the vegetation.

No experiments have been made with irrigation of arable crops, but data relating yields to rainfall suggest that in many parts of Sweden crops do not get enough rain to produce maximum yields. It is doubtful, however, whether irrigation would be an economic proposition.

[1088] (489)631.67
NIELSEN, N. C. Om Vanding i Danmark. **[Irrigation in Denmark.]** *Nord. JordbrForsk.* 5-6, 1948 (634-642). [Da.]

The Danish Peat Society has made many experiments with irrigation. The best known, at Hesselvig Enggaard, was started in 1870, and comprises experiments on irrigation, manuring, cultivation and drainage. In the first 30 years, when manures were not used, the initial good results of irrigation declined. Since manuring (with PK) started in 1903, the increases in hay yields obtained from both irrigation and manuring have risen with time. In general, irrigation without manuring is of little value.

Most irrigation in Denmark has utilized naturally flowing water by flooding, spreading with canals, etc. Attempts are being made to devise economic mechanical systems, including overhead irrigation, to extend irrigation to field crops, and to utilize sewage and waste waters.

[1089] (489)633.15-1.5
JUNCKER, F. Erfaringer med majsdyrkning på Overgaard 1948. **[Experiences with maize cultivation at Overgaard in 1948.]** *Tidsskr. Landøkon.* 1949 (113-128). [Da.]

Attempts were made in 1947 and 1948 to grow maize in Denmark as a silage crop. Experience so far gained indicates that there are possibilities for growing the crop in Denmark, but the weather was abnormal in the two years, and no definite conclusions can be drawn yet.

[1090] (492)631.4
MASCHHAUPT, J. G. Bodemkundige onderzoekingen in het Dollardgebied. **[Soil investigations in the Dollard area.]** *Versl. Landbouwk. Onderzoek.* 54, No. 4, 1948, pp. 222. [Du.e.]

The Dollard, an estuary in the province of Groningen, was formed by the destruction of the bank of the Eems. The polder soils formed by the deposition of silt and clay on the low-lying peat are described, and sand, clay, organic matter, Ca and Mg contents determined.

[1091] (492)631.47
EDELMAN, C. H. La classification et l'estimation de la valeur des terrains agricoles aux Pays-Bas et aux Indes Néerlandaises. **[The classification and estimation of the value of agricultural soils in Holland and the Dutch East Indies.]** *C.R. Acad. Agric.* 34, 1948 (636-641). [F.]

A study has been made into soil conditions associated with plant yields in market gardening and horticulture as a first step in facilitating voluntary changes required in land use in the rationalization of the use of Dutch soil. The project is based on the preparation of maps indicating soils of the first and second quality and specifying the crops concerned. The best guide to productive capacity has been the study of the soil profile in place : analysis of nutrient content of long-fertilized soils can be misleading. The second step is the delimitation of submarginal areas followed by their afforestation. For the other areas of medium fertility, a soil inventory indicating the local distribution of soils of different capabilities should help solve a primary problem of these areas—the existence of holdings too small to be economic.

Classification of the tropical soils under native cultivation requires another approach, as human rather than soil conditions limit agricultural possibilities. Fertilizers cannot usually be applied and the chemical and mineralogical composition of the soils must considerably influence the choice of land use. In the fertilized plantations, however, the same approach is used as in developed temperate countries.

[1092] (494)631.416.2
GISIGER, L. Die Phosphorsäureversorgung unserer Böden. **[The provision of phosphoric acid to our soils.]** Repr. *Landw. Vortr.* 15, 1946?

The pre-war and wartime P fertilizing and the P status of Swiss soils is discussed together with the solubility and effects of different sources of P. Wartime conditions, including the lack of basic slag, did not in general cause much impoverishment in the soil P or a decrease in productivity.

[1093] (494)631.851
ALTHAUS, H. Über die Abbauwürdigkeit Schweizerischer Phosphatlager. **[The possibility of exploiting Swiss phosphate deposits.]** *Landw. Jahrb. Schweiz* 25, 1947 (35-58). [G.]

The P_2O_5 content is in general too low for economic exploitation.

[1094] (495)63 : 551.5
NUTTONSON, M. Y. **Ecological crop geography of Greece and its agro-climatic analogues in North America.** *Amer. Inst. Crop Ecol. Internat. Agro-Climat. Ser.* 5, 1947, pp. 17.

[1095] (497.1)63 : 551.5
NUTTONSON, M. Y. **Agricultural climatology of Yugoslavia and its agro-climatic analogues in North America.** *Amer. Inst. Crop Ecol. Internat. Agro-Climat. Ser.* 4, 1947, pp. 11.

(5) ASIA

(*See also* Abs. Nos. 811, 909, 980, 981, 1023)

[1096] (51)63 : 551.5
NUTTONSON, M. Y. **Ecological crop geography of China and its agro-climatic analogues in North America.** *Amer. Inst. Crop Ecol. Internat. Agro-Climat. Ser.* 7, 1947, pp. 28.

[1097] (51)631.4
CHU, S. M. **Soils of Kiangsi province.** *Soils Quart.* 7, 1948 (1-18). [Ch.e.]

[1098] (51)631.416
CHANG, N. F.; CHU, H. F. **Soil fertility test of Szechwan province.** *Soils Quart.* 7, 1948 (19-26).

Szechwan soils are deficient in N and in some places in P. Rice requires more N fertilizer than do rapeseed and wheat, and rapeseed requires more P fertilizer than do rice and wheat.

[1099] (51)631.432.4
LI, C. S.; LI, L. Y. **[The determination of field capacity and wilting coefficient of some soils near Kushan, Foochow.]** *Fukien Agric. J.* 9, 1948 (169-180). [Ch.e.]

[1100) (51)631.435
CHANG, L. Y.; LI, L. Y.; CHOU, C. Y. **[The mechanical analysis of some soils near Kushan, Foochow.]** *Fukien Agric. J.* 9, 1948 (163-168). [Ch.e.]

[1101] (51)631.47
HSI, C. F. **Suggestions on good land use in the red-earth region of south China.** *Soils Quart.* 7, 1948 (27-34). [Ch.e.]

[1102] (52)63
LADEJINSKY, W. I.; LEONARD, W. H.; WILLIAMSON, M. B. **Prospects for Japanese agriculture.** *Foreign Agric.* 12, 1948 (240-245). [Nat. Resources Sect., SCAP, Japan]

The question of whether or not Japan will be able to meet its food requirements from indigenous production is discussed from the point of view of expansion of arable acreage, higher yields, additional labour and agrarian reform. The preponderance of hilly and mountainous country limits the cultivated area to 16% of the total. It is concluded that the Japanese are unlikely to increase crop yields above those of pre-war years and that they must continue to import large amounts of food.

[1103] (52)63
SALMON, S. C. **Crop improvement in Japan.** *J. Amer. Soc. Agron.* 40, 1948 (1017-1035). [U.S.D.A., Bur. Pl. Indust.]

A report of impressions obtained in a 7-months visit Dec. 1945—July 1946.

[1104] (52)631.47
LADEJINSKY, W. I. **Land reform progress in Japan.** *Foreign Agric.* 13, 1949 (38-41).

[1105] (52)631.81
SWANSON, C. W. L. **Fertilizer practices for the staple food crops in Japan.** *Proc. Natl. Joint Cttee. Fert. Appl.* 22, 1946 (37-52). [Conn. Agric. Expt. Sta.]

Rice occupies approximately 53% of the total cultivated area and is grown mainly on irrigated lowlands. Intercropping practices on the upland fields increase the arable land area from 15,000,000 acres to a total of 17,300,000 cropped acres. The amounts of N, P and K fertilizers which should be applied are recommended by the Ministry of Agriculture and Forestry, but supplies of fertilizers are insufficient to meet these requirements. The recommended amounts, sources and time of application of fertilizers for paddy rice, nursery seedbeds, wheat, naked barley, barley, sweet potato and potato are given.

[1106] (54)631.414.2 : 631.48
AGARWAL, R. R.; MUKERJI, P. **Studies in Bundelkhand soils of the United Provinces. II. Chemical composition of the clay fractions in relation to the process of soil formation.** *Indian J. Agric. Sci.* 16, 1946 (483-491).

An analysis was made of the clay fractions of three genetic soil types: (1) a high-lying, coarse-grained, reddish brown soil, (2) a yellowish brown sandy loam of flatter topography than (1), and (3) an impervious black, low-lying clay. The analyses showed that minerals containing Fe and Mg were subjected to the greatest amount of weathering. In (1) MgO increased with depth while Fe accumulated in the upper layers, presumably because of its lower solubility and the immature character of the profile. In (2)

MgO was deposited with CaO in the C horizon as *kankar* nodules and free Fe_2O_3 tended to be eluviated. MgO was distributed as small *bajri* particles in the C horizon of type-(3) profile, while free Fe_2O_3 accumulated in the top layers. SiO_2/R_2O_3 increased with depth in type-(1) profile, was highest in the B horizon of (2) and decreased with depth in (3). Consideration of the distribution of SiO_2/Al_2O_3 indicated that the Al_2O_3 was the most stable component of R_2O_3. Except for the A horizon of (2) the exchange capacity followed the trend of variation in SiO_2/Al_2O_3.

Except for the behaviour of Fe_2O_3, that may be ascribed to the greater disruptive action of tropical temperatures on the ferro-magnesian minerals, the soil clays show the characteristics of chernozems and may be regarded as typical "tropical chernozems."

[1107] (54)631.47
HUSAIN, M. M.; MUKHERJEE, J. N. **An outline of the problems of land utilization and conservation in India.** *Roy. Soc. Emp. Sci. Conf. Rept. 1946,* 2, 1948 (259-271).

[1108] (548.7)631.416.2 : 631.414.3
KANDIAH, S. **The fixation and availability of phosphates in some Ceylon soils.** *Trop. Agricst.* 104, 1948 (17-26).

Most of the 11 soils studied were acid and low in readily available P; the 2 neutral and slightly alkaline soils had fair amounts of available P. The acid soils were high in alkali-soluble fractions. Fe and Al phosphates were the main constituents of the alkali-soluble inorganic fraction. The organic fraction, though not directly available to plants, is, on decomposition, a valuable source of P. Acid-soluble P was highest in soils of limestone origin and lowest in the laterite soil which showed the highest fixing power. Subsoils fixed P to a greater extent than did their surface soils. The fixing power of organic matter was low. Practical suggestions are made for increasing the availability of soil P and for decreasing fixation.

[1109] (548.7)631.58
JINENDRADASA, P. T. **Rotational farming scheme, Kurundankulama, North-Central Province.** *Trop. Agricst.* 104, 1948 (27-37).

A dry-farming experiment was started in 1938 on an unirrigated block of 100 acres of non-lateritic chocolate-brown loam to determine if soil fertility could be maintained over long periods under prevailing climatic conditions and if the peasants could be trained to substitute rotational farming for shifting cultivation. The maintainance of soil fertility seems possible, using 1 acre for home garden and 9 acres for arable land of which 6 acres will be under seasonal crops and 3 under pasture and fodder. There was no difficulty in training peasants in this type of farming.

[1110] (56)631.416.2
EVLIYAR, H. Ankara topraklarinda fosfor vaziyeti. **[Phosphorus in Ankara soils.]** *T.C. Yüksek Ziraat. Enstit. Ankara* 1945, pp. 121. [T.g.]

The soils, which are mainly loamy or clayey marls or clays, are from fairly to very rich in P soluble in 10% HCl, but the ratio P/sesquioxides is generally unfavourable and most of the soils responded to P fertilizing of the stubble. During fallows, however, nutrients were mobilized and fallowed land responded only weakly to P fertilizing.

[1111] (564.3)631.81
LOIZIDES, P. **Recent fertilizer trials.** *Countryman, Cyprus* 3, No. 2, 1949 (6, 13).

8 years' experiments show that potatoes respond well to N and to a less extent to P fertilizers, but not to K. 10 years' trials show that wheat grown continuously requires N and P. Following a legume, wheat required P, but little or no N. Super. was the best form of P fertilizer for potatoes and wheat; bonemeal was useless. $(NH_4)_2SO_4$ increased yield of grapes, but slightly reduced the sugar content, the reduction being greater in the absence of K and P fertilizers than in their presence.

[1112] (564.3)634-1.5
HAMBOULLAS, K. **Deciduous fruit growing in Cyprus.** *Cyprus Dept. Agric. Leaflet* 20, pp. 12.

(6) AFRICA

(*See also* Abs. Nos. 864, 881, 912, 935, 1011)

[1113] (62)633.51-1.811.1
EL HINEIDY, M.; ALLAM, F. **Cotton crop yield in relation to application of fertilizers.** *Nature* 163, 1949 (362). [Fouad Univ., Giza]

NPK gave much higher yields than PK. Egyptian soils contain relatively large

amounts of unavailable P and K, but little N. $(NH_4)_2SO_4$ is probably the most suitable N fertilizer, because the sulphate ion neutralizes the alkalinity of the soil, whose pH is about 8.0, and so makes some of the P available.

[1114] (648)631.415.3
MEDINA, M. A.; ALVIRA, T. A. Estudio geologico-edafico de unas muestras de suelo salino de la Sebja de Ougranat (Sahara Español). **[Geological-pedological study of saline-soil samples from the Ougranat saltpan (Spanish Sahara).]** *An. Inst. Esp. Edafol.* 7, 1948 (123-133). [Sp.]

The Ougranat depression is fed from wadis traversing salt-rich areas and by saline ground water. A broad margin is covered by slope debris merging into a region of clayey sands passing into zone 1, a light bright yellow soil. In zone 2, more to the interior, an increase in clay content leads to the dry-season formation of large blocks thinly encrusted with salt. In the interior the salt crust becomes thicker. 4 horizons of a zone-1 sample were analysed mechanically, chemically and for pH and base-exchange capacity. The soil is an undegraded saline soil with abundance of carbonates, the clay content varying from a maximum of 12.9% in the 10-35-cm. horizon to a minimum of 6.5% at a depth of 50 cm.+and the soluble-salt content from 4.33% to 9.37% in the 2 horizons respectively. NaCl cubes occur below 35 cm., their length of edge reaching 2 cm. below a depth of 50 cm.

[1115] (649)631.4
HOYOS, A. Contribucion al estudio de los suelos Canarios. **[Contribution to the study of Canary-Islands soils.]** *An. Inst. Esp Edafol.* 7, 1948 (257-271). [Sp.]

Mechanical and chemical profile analyses of soils formed on clay sediments and on volcanic rocks indicate that chemical weathering is small and increases with precipitation in the order Grand Canary—Tenerife—La Palma. Because of the relative humidity of the atmosphere the soils escape aridity and are fairly fertile. Where chemical weathering to some extent occurs, the tendency is to the formation of grey soils.

[1116] (65)631.4
AUBERT, G.; MONJAUZE, A. Observations sur quelques sols de l'Oranie Nord-Occidentale—influence du déboisement, de l'érosion, sur leur évolution. **[Observations on some soils of North-West Oran—effect of deforestation and erosion on their evolution.]** *C.R. Soc. Biogéog.* 23, No. 199, 1946 (44-51). [F.]

Northwest Oran is mostly made up of a series of fairly low plateaux. Except for a region of Pliocene grit and hard dolomitic limestone in the north, the soils are formed on marls or sands and are liable to erosion by wind and water. Rainfall varies from less than 300 mm. on the plains to over 500 mm. on the plateaux, is violent in autumn and winter and almost nil from May to September. Temperature is also variable. Owing to the diversities in climate, sub-soil and topography the soils vary considerably. A typical succession comprises calcareous steppe and grey carapace soils which are exhausted relics of humus-rich soils; brown carapace soils containing more organic matter; red-brown soils on the lower slopes; red Mediterranean soils developed over limestone, and shallow brown soils where there is little movement of elements in the profile. With higher rainfall and altitude leached brown soils which support evergreen oak, red soils or, over softer limestone, rendzinas occur. On the summits there is a tendency to podzolization. Records, and studies of soil morphology show that Oran was originally a much more wooded district, but destruction of the trees, whose regeneration is hindered by the dry climate and action of goats, and cultivation has led to the formation of steppe soils or, where topography and human activities have favoured erosion, to soil degradation. The necessity for soil-conservation measures is emphasized and recommendations are made.

[1117] (667/9)633.74-1.4
VOELCKER, O. J. **West African Cacao Research Institute: Field experiments.** *Emp. J. Expt. Agric.* 16, 1948 (241-248).

The research station lies at an altitude of 640-755 feet and the topography is gently undulating. The soils of the upper slopes are sedentary with a typical profile of surface sandy soil with humus, below which at 1-2 feet lies a concretionary layer, with mottled clay at 2-10 feet overlying decomposing rock.

Lower down the slopes the surface sandy layer may reach a depth of 6 feet or more before the rotten, clayey, decomposing rock is reached. In the small valley bottoms the soils are grey sand or clay and are water-logged for considerable periods. The upland sedentary soils are most suited to cacao and these cover only half the area. They are typical of large areas of cacao farms in the Gold Coast and Nigeria. The upland soils have been reserved for standard experiments; the soils of the slopes and valley bottoms are used for clonal multiplication; the poorest soils are to be used for the study of the effects of drainage and the application of fertilizers.

[1118] (669)631.4
VINE, H. **The soil resources for increased production.** *Farm and Forest* 9, 1948 (21-27). [Dept. Agric.. Nigeria]

The origin and physical properties of the soils of Nigeria are described. The soils include (1) red and yellow sandy soils, lacking undecomposed minerals, and soils 4-12 feet deep overlying granite and metamorphic rocks on the coastal areas where rainfall is heavy; (2) inherently fertile soils of the northern strip of Nigeria, formed from loose desert sand overlying decaying granite and forming important groundnut soils, though millet often interplanted with cow-peas is the main crop; (3) further south in the Northern Provinces the soils are transported, fine sandy soils which become compacted and tend to waterlog. Intensive mechanized farming has good prospects on this type; (4) neighbouring brown loamy sands with excellent physical properties, directly weathered from the underlying rock after complete removal of the old ironstone capping; (5) extensive plains of poor, shallow, grey-brown sandy soils overlying ironstone sheets; (6) reddish brown, coarse sandy soils merging below into red coarse sandy clay loam extending to a great depth in the Niger Province. The land is cropped for 3-4 years and then reverts to fallow; the area is proposed for the Groundnut Scheme; (7) red or brown clays of the cacao-growing areas in the Western Provinces. These soils have been cropped in rotation for 25 years without fertilizers; (8) red or brown loamy sands with free drainage and good physical properties in the Western Provinces; (9) exhausted, deep, sandy soils with no reserves of fertility in the Eastern Provinces.

[1119] (673)631.445.7
COSTA, J. V. B. DA; AZEVEDO, A. L. Les terres noires du nord de l'Angola. **[The black soils of the North of Angola.]** *C.R. Sem. Agric. Yangambi* 2, 1947 (594-607). [F.] [Lisbon]

A study of the soils of the Catete region failed to show the typical chernozem granular structure in any of the soils. They are therefore for the present classified as "black tropical soils" Continuous growing of cotton even on slight slopes gives rise to gullying. On steeper slopes cotton should be grown in alternate strips with soil-protecting crops and even on terraces.

[1120] (675/6)631.47
EMPIRE COTTON GROWING REVIEW. **Agriculture in the Belgian Congo.** *Emp. Cott. Grow. Rev.* 26, 1949 (1-3).

In reviewing the Proceedings of the I.N.E.A.C. Conference of 1947 at Yangambi, the lessons to be learnt from the exploitation of the forests of the Belgian Congo by the application of European agricultural methods are pointed out, and a warning is given to the sponsors of schemes for the present exploitation in East Africa of areas of inferior soil hitherto neglected by African cultivators. Decrease in crop yields with degeneration of the soil was followed in the Congo by conservation methods, application of organic manures and chemical fertilizers and rotation of short-term crops, all with disappointing results in the maintenance of a healthy physical condition of the soil. Good local traditional practices which are adapted to the local conditions, and previously despised by Europeans, should be improved. There should be greater economy of land use by allotting to each cultivator in a social group a plot of land (6-8 ha.) sufficiently large to permit of a succession of crops in rotation with a fallow period long enough to regenerate soil fertility.

[1121] (675)631.4
FOCAN, A.; LIVENS, J. Aperçu sur les types de sols entre Stanleyville et Buta. **[Soil types between Stanleyville and Buta.]** *C.R. Sem. Agric. Yangambi* 2, 1947 (557-569). [F.] [I.N.E.A.C.]

[1122] (675)631.4
WAEGEMANS, G. Essai d'interprétation de la fertilité de certains sols congolais. **[Fertility in certain Congo soils.]** *Bull. Agric. Congo Belge* 39, 1948 (326-332). [F.]

A preliminary discussion of studies of the agricultural value of recent Lower-Congo calcareous-schist soils lacking any reserve of alterable rock and whose sole nutrient resources are those due to clay saturation before emergence from water. The fertile soils are those in which a horizon of sandy clay or of pebbles and clay occurs fairly near the surface. Such chemically poor sediments are in general of considerable agricultural value when their structure and subterranean water regime are satisfactory.

[1123] (675)631.459 : 631.61
BILDERLING, G. DE Dégradation du sol des savanes de l'Ubangi et problèmes qu'elle pose. **[Degradation of the savanna soils of the Ubangi and associated problems.]** *C.R. Sem. Agric. Yangambi* 1, 1947 (90-96). [F.] [I.N.E.A.C.]

The principal causes of the degradation of these soils and the regression of forests, which are being rapidly replaced by savannas, are the long dry seasons which encourage erosion, the extensive cultivation practised by the natives, and bush fires. These bush fires are set alight by native hunters every year notwithstanding interdictions. Suggested measures include an inventory of all lands in each chief's territory, organization of agricultural sections, improved communications, control of bush fires and tree felling, intensified propaganda on soil protection and reduction of areas cultivated by the natives, together with measures for increasing productivity.

[1124] (675)631.459 : 631.61
HENRY, J. Le ravitaillement des populations de la zone équatoriale forestière et la conservation du sol. **[Feeding the populations of the forest equatorial zone and soil conservation.]** *C.R. Sem. Agric. Yangambi* 1, 1947 (307-329). [F.]

Soil fertility in the Belgian Congo is wasted more by the growing of food crops than by any other type of land use. Two principal ways of preventing it are by reducing the amount of land brought annually into cultivation and by rational and economic exploitation of the land already reclaimed.

[1125] (675)631.459 : 631.61
LOECKX, M. A. Erosiebestrijding in het Gewest Mahagi. **[Combating erosion in the Mahagi Territory.]** *Bull. Agric. Congo Belge* 39, 1948 (511-530). [Fl.f.]

Sheet erosion due to soil impoverishment has increased because of population pressure, cash-cropping and land grants to Europeans. Gully erosion is exceptional. The results of 2 or 3 years only of anti-erosion studies include : (1) in attempts to enrich the bush fallow, sowings of *Tephrosia* sp., *Cassia laevigata*, *C. didimobotrya* and *Erythrina abyssinica* developed well in unprepared ground invaded by *Digitaria scalarum*, but cuttings of savanna trees gave no result ; (2) *Pennisetum purpureum*, *Coleus barbatus* and vetivert are useful for soil-stabilizing hedges ; (3) strip cropping between strips of fallow is effective in holding soil ; (4) contour terracing is justified only with fertile soils and (5) *Acacia decurrens* and *Ficus* spp., are useful firebreaks. The effect of limiting pasturage to paddocks within hedges of *Caesalpinia sepiaria*, *Agave*, *Cassia*, etc., is being studied.

[1126] (675)631.51
WOUTERS, W. Un mode de défrichement du sol pour les cultures des savanes equatoriales. **[A method for reclaiming the soil for crops of equatorial savannas.]** *C.R. Sem. Agric. Yangambi* 1, 1947 (263-265). [F.]

After the removal of the grass cover the field is laid out in lines and hoed, the grass being placed between the lines. Seed is sown in the lines. The grass mulch protects the soil until the crop covers it completely. The hoeing helps to destroy the rhizomes of *Imperata cylindrica* which are very harmful to young plants.

[1127] (675)631.58
DAELE, A. VAN Aperçu sur les méthodes culturales adoptées au Mayumbe. **[Outline of the methods of cultivation in use in Mayumbe.]** *C.R. Sem. Agric. Yangambi* 1, 1947 (87-90).[F.] [I.N.E.A.C.]

The rainfall is extremely irregular. The principal objectives in choosing suitable cultivation methods are erosion- and drought control. For this purpose the first method is avoidance of burning the forest, thus preserving the organic matter ; this is followed by contour cropping and terracing.

[1128] (675)633.855.34-1.4

LIVENS, J. Caractéristiques pédologiques de quelques palmeraies naturelles et artificielles au Kwango-Kasai. **[Pedological characteristics of certain natural and artificial palm groves in the Kwango-Kasai.]** *C.R. Sem. Agric. Yangambi* 2, 1947 (570-581). [F.]

The oil-palm soils in the Kwango are poor, light and unstable. On these soils a suitable environment for oil-palms is likely to be found under forest conditions. Hilly areas should be avoided as well as soils under savanna vegetation.

[1129] (678)631.47

ROUNCE, N. V. **The development, expansion and rehabilitation of Sukumaland.** *Emp. Cott. Grow. Rev.* 26, 1949 (32-41).

A reprint from *East African Annual* 1947-48. Sukumaland is cultivation-steppe land, grossly overcrowded with people and stock, and suffering from severe erosion and deterioration of arable land and grassland. The organization of a scheme is described for spreading the people and stock into areas at present unoccupied, providing more water supplies, expanding present methods of soil and water conservation and manuring, and introducing mechanical aids for cultivation. There need be no reduction in stock, though they should be culled and redistributed.

[1130] (678)631.47 : 581.5

GILLMAN, C. **A vegetation-types map of Tanganyika Territory.** *Geog. Rev.* 39, 1949 (7-37).

The vegetation is mostly a mixture of woodland or bushland with grassland, the distribution being primarily determined by variations of soil and water conditions and the use made of them by man. The classification is strictly physiognomic and the main types shown on the coloured map on a scale of 1 : 2,000,000 include forest, woodland, bushland and thicket, grassland, permanent swamp vegetation, desert and semidesert and vegetation actively induced by man in native and non-native cultivations. The term "actively induced vegetation" includes the mixed and constantly changing pattern of cultivated crops, pastures and interspersed remnants of the original vegetation and of scattered small areas of secondary growth occurring on the plateau, in the Highlands and along the coast.

[1131] (68.01)63

SOUTH AFRICAN DEPARTMENT OF AGRICULTURE. **Agro-economic survey of the Union.** *S. Africa Dept. Agric. Bull.* 270, 1948, pp. 192.

Topography, climate, soils, vegetation, farming systems and land utilization are described for the dryland farming areas of the inland plateau, the Transvaal highveld, the northern and north-western Orange Free State, the Caledon River area, the western Transvaal and the central area.

[1132] (68.01)631.459

KLINTWORTH, H. **Desert encroachment over the Karoo.** *Farm. S. Africa* 23, 1948 (723-728). [Div. Chem. Serv.]

The Karoo vegetation is deteriorating and the carrying capacity of the veld is decreasing. Changes in the soil caused by cultivation and the re-establishment of vegetation are considered. In many of the shallow-soil areas the soil has been eroded to below the critical depth required for maintaining good grass cover. On deeper soils, poor penetration of rain water, drying winds and high soil temperatures make it impossible for new plants to establish themselves. In the shallow soils on dolerite hills the water balance is more favourable and many of them carry good stands of grass. Overgrazing on these hills is one of the causes of increased runoff and of soil erosion on the shallow shale soils of the lower slopes. It is believed that the underground water of the Karoo originates in these dolerite hills and if their vegetation is preserved the Karoo may be regenerated.

[1133] (68.01)633.491-1.5

SELLSCHOP, J. P. F.; DU TOIT, J. J. **The production of potatoes.** *Farm. S. Africa* 23, 1948 (645-654). [Coll. Agric., Potchefstroom]

Rotational cropping, soil requirements and cultivation, fertilizers, weeds and eelworm infestation are discussed.

[1134] (689)551.481

DEBENHAM, F. **The water resources of Central Africa.** *Geog. J.* 111, 1948 (222-234).

[1135] (691)634.61-1.616
FRAPPA, C. **Analysis of soils from coconut plantations on the northwest shoreline of Madagascar.** *Oléagineux* 3, 1948 (390-397). C.A. 43 (1509).

Most of the trouble in the coconut plantations can be attributed to defective choice of terrain and poor maintenance of soil fertility. Two zones, one of soft mud covered with salt water at high tide, and the other a firmer ground above the high-water mark, have been recovered as polders and drained. Soil analysis of five areas of varying ages showed the soils to be more or less sandy and acid, except for a two-year polder. The soils become denser with depth, with a bluish clay mud. All polders were deficient in P and K, while CaO content varied and depended on the accumulated debris of sea shells.

(7) NORTH AND CENTRAL AMERICA

(*See also* Abs. No. 865)

[1136] (71)631.452 : 631.44
MACLEAN, A. J.; ATKINSON, H. J.; TURNER, R. C. ET AL. **Fertility studies on soil types. I. Some observations on Carleton County investigations.** *Sci. Agric.* 29, 1949 (1-12).

The paper illustrates the approach to fertility studies which have been initiated in cooperation with farmers throughout Canada. Response data from simple field tests are integrated with response in the greenhouse and with laboratory studies. In general, on these soils, grain responds to NP and legumes to PK and a large grain yield tends to reduce the yield of the subsequent hay crop.

[1137] (712.2)631.4
LEAHEY, A. **Characteristics of soils adjacent to the Mackenzie River in the Northwest Territories of Canada.** *Proc. Soil Sci. Soc. Amer. 1947*, 12, 1948 (458-461). [Dept. Agric., Ottawa]

[1138] (728)631.875
MONTEALEGRE, M. R. La evolución de la fabricacion de composte en la America Central. **[The growth of compost production in Central America.]** *Rev. Inst. Def. Café Costa Rica* 19, 1948 (93-97). [Sp.] [Inst. Def. Café Costa Rica]

A continuous and beneficial increase is claimed in the use of compost prepared from town or plantation waste by the Indore system.

[1139] (73)631.47
REUSS, L. A.; WOOTEN, H. H.; MARSCHNER, F. J. **Inventory of major land uses in the United States.** *U.S.D.A. Misc. Pub.* 663, 1948, pp. 89.

[1140] (73)631.83 : 631.812
AGRICULTURAL CHEMICALS. **Potash—its role in the fertilizer industry.** *Agric. Chem.* 3, No. 12, 1948 (25-28, 78).

The development of the U.S. potash-fertilizer industry from 1914 to the present day is reviewed.

[1141] (75/6)631.459 : 631.61
SELL, A. E. **An introduction to the work of the Tennessee Valley Authority.** *Fert. Soc. Pap.* 1948 (1-9).

The output of cereals and row crops increased in 12 years by 13 and 25% in spite of largely decreased acreages, and of hay by 33%. This has been due mainly to the use of P and Ca to establish clover or lucerne leys of 3-5 years' duration, followed in a 7-10 year rotation by cash and fodder crops.

[1142] (75)634-2.191 : 546.47 : 546.27
SHEAR, G. M. **Zinc and boron deficiency in Virginia orchards.** *Va. Fruit* 36, 1948 (150-152). Biol Abs. 22 (2543).

Availability of Zn in soils may be reduced by lime and manure, and the tree may be unable to absorb Zn because of root injury caused by too much cultivation and low N nutrition. Spraying with 25 lb. of $ZnSO_4$ in 100 gal. of water while the tree is dormant is recommended. B deficiency may be corrected by applying $\frac{1}{2}$ lb. of borax to the soil for trees under 12 years and 1 lb. for older trees. One application every 3-5 years should be sufficient.

[1143] (76)631.62
HARRISON, R. W.; KOLLMORGEN, W. M. **Drainage reclamations in the Bartholomew-Boef-Tensas Basin of Arkansas and Louisiana.** *La. Agric. Expt. Sta. Bull.* 476, 1948, pp. 68.

[1144] (76)631.81
CLAPP, G. R. **The TVA and the fertilizer industry.** *Amer. Fert.* 109, 1948, No. 12 (10-11, 20-22); No. 13 (11, 26-28).

Test demonstrations in the TVA are showing how best to use new fertilizer materials for changing farm systems and for increasing the use of water resources.

[1145] (77)631.4 : 551.311.33
HUTTON, C. E. **Studies of loess-derived soils in southwestern Iowa.** *Proc. Soil Sci. Soc. Amer. 1947*, 12, 1948 (424-431).

[1146] (77)631.44
RIECKEN, F. F.; ALLAWAY, W. H.; SMITH, G. D. **Some soil classification and mapping problems in the Wisconsin drift area of Iowa.** *Proc. Soil Sci. Amer. 1947*, 12, 1948 (432-440).

[1147] (77)631.48
KRUSEKOPF, H. H. **Gumbotil—its formation and relation to overlying soils with claypan subsoils.** *Proc. Soil Sci. Soc. Amer. 1947*, 12, 1948 (413-414). [Missouri Agric. Expt. Sta., Columbia]

It is shown that the dense, plastic clay known as gumbotil is not, as was thought, a product of weathering of the glacial till which covers northern Missouri, but a deposit from the end of the glacial period when there were large quantities of stagnant or slowly-moving melt waters laden with clay material.

[1148] (77)631.58 : 631.81
TYSON, J. **Soil management in the upper peninsula of Michigan.** *Mich. Agric. Expt. Sta. Spec. Bull.* 345, 1948, pp. 60.

[1149] (78/9)631.67
UNITED STATES DEPARTMENT OF AGRICULTURE. **Irrigation agriculture in the West.** *U.S.D.A. Misc. Pub.* 670, 1948, pp. 39.

A survey with numerous maps of present and future irrigation development and its physical and climatic setting in the 17 Western States, including discussions of the types of land use and irrigation enterprises, the supply and use of surface and ground water and the types, quantities and value of crops under irrigation.

[1150] (78)633.16-1.5
ROBERTSON, D. W.; KOONCE, D.; TUCKER, R. ET AL. **Culture of barley in Colorado.** *Colo. Agric. Exp. Sta. Tech. Bull.* 39, 1948, pp. 23.

Recommendations are made including those concerned with climate, soils, crop sequences, seedbed preparation, sowing and irrigation.

[1151] (79)634.63-1.5
HARTMANN, H. T. **The olive industry of California.** *Econ. Bot.* 2, 1948 (341-362). [Univ. Calif., Davis]

After reviewing the production of olives in the Mediterranean region, the California industry is described. The soil types concerned and fertilizer, irrigation and cultural practices are included.

[8] SOUTH AMERICA

[1152] (81)631.452 : 631.589
RAWITSCHER, F. **The water economy of the vegetation of the 'Campos Cerrados' in southern Brazil.** *J. Ecol.* 36, 1948 (237-268). [Univ. São Paulo]

The studies were made in the Emas and Lagoa Santa where the soil is a fertile, homogeneous red loam of pH 5 and at least 20 m. deep. The ground-water level is maintained at 17-18 m. throughout the year. There is no superficial erosion except where the ground has been artificially cleared, as in overstocked ranges, bare fallow and coffee plantations. Considerable burning has taken place. From the non-xerophytic character of the vegetation and the existence of forests

in undisturbed areas it is concluded that the climax vegetation would be primary forest and the present stunted savanna-like vegetation is a fire climax. The infertility of the Cerrado land is ascribed to agricultural and silvicultural methods introduced from temperate climates.

[1153] (82)631.4
PAPADAKIS, J. S. Tres informes ecologicos. **[Three ecological reports.]** *IDIA Spec. No.* 1948, pp. 42. [Sp.]

The climate, soils, land use and agricultural potentialities of the northern Argentinian provinces of (1) La Rioja and Catamarca, (2) Tucuman, Salta and Jujuy and (3) Corrientes are discussed.

In (1) the soils are generally immature, light and stony. Grey desert soils and red desert sands are widespread and salty land is common. Saline irrigation water has often been used for many years without ill effects on vine and olive. In (2) the soils are in general immature. Nitre-impregnated soils occur in the zerophytic areas. Most of the crops are grown with irrigation but much dry maize etc., could be grown. In (3) bright or red sandy soils are common, generally above chalk and often greyish due to a fairly high organic-matter content. Many are waterlogged for part of the year. The region is rather humid and of considerable potential fertility. Some lateritic soils occur in the eastern sections.

[1154] (82)631.459 : 551.55
WEBER, T. F. A. El clima de General Pico vinculado a la erosion eolica. **[The climate of General Pico in connection with wind erosion.]** *Inst. Suel. Agrotec. Argent. Pub.* 5, 1947 (33-72). [Sp.]

In this part of the La Pampa territory the soils are deep light fertile sands. The water table, now more than 8 m. deep, has dropped 5 m. in the last 30 years. The rainfall and wind strength and direction in each of the 4 seasons is compared with the frequency of earth and sand storms. Autumn is the safest season for working the ground and sowing, and spring and winter the most dangerous. The area is most suited to livestock production or mixed husbandry with long fallows.

[1155] (881)633.61-1.5
COOPER, S. G. C.; JONES, E. G. B. **Cane-farming in British Guiana.** *Trop. Agric. Trin.* 24, 1947 (121-126).
Cane-farming or cultivation of cane by farmers in small units is described. Basic needs of the industry are improved drainage and conservation of soil fertility.

(9) OCEANIA

[1156] (931)63
CUMBERLAND, K. B. **The agricultural regions of New Zealand.** *Geog. J.* 112, 1949 (43-63).

The general character of New Zealand agriculture is described and maps show the agricultural regions and the distribution of grassland, cows, sheep, field crops, hay and silage, wheat and maize.

[1157] (941)631.459 : 631.61 : 34
WISE, F. J. S. **The importance of soil conservation.** *Government Printer, Perth,* 1945, pp. 11.

A reprint of a speech by the Premier of Western Australia in moving the second reading of a Bill for the Conservation of Soil Resources and theM itigation of Erosion, 6th September, 1945.

[1158] (941)633.1-2.191 : 546.56
DUNNE, T. C. **Copper deficiency of cereal crops in Western Australia.** *J. Dept. Agric. W. Aust.* 25, 1948 (76-81).

Areas where Cu deficiency may occur in Western Australia and symptoms and diagnosis are described. Intelligent use of Cu on certain soil types is necessary as heavier clays and loams are amply supplied and give no additional yield with Cu fertilizer.

[1159] (942)631.459 : 631.47
HERRIOT, R. I. **Soil conservation districts. Murray Mallee District proclaimed.** *S. Aust. Dept. Agric. Leaflet* 10/47, 1947, pp. 3.

[1160] (942)631.459 : 631.61 : 34
HERRIOT, R. I. **The soil conservation act and what it means.** *S. Aust. Dept. Agric. Leaflet* 5/45, 1945, pp. 3.

The provisions of the Soil Conservation Act of 1939 are outlined.

RECENT BOOKS

551.586 BERG, H.
Einführung in die Bioklimatologie. [Introduction to Bioclimatology.] H. Bouvier u. Co., Bonn. [194?] Pp. iv+131. DM. 7.50

577.15.04 MITCHELL, J. W.; MARTH, P. C.
Growth Regulators for Garden, Field and Orchard. Univ. Press, Chicago, and Cambridge Univ. Press. 1947. Pp. vii + 129. 15s. od.

627.51 BARROWS, H. K.
Floods—Their Hydrology and Control. McGraw-Hill. 1949 [?] Pp. 432. 39s. od.

63 SCHMIDT, G. A.; MARCUS, A.
Handbuch der Tropischen und Subtropischen Landwirtschaft. [Manual of tropical and subtropical agriculture.] J. W. Edwards, Ann Arbor, Mich. Photographic reproduction of 1943 edition, 1945. Vol. I, pp. 830. Vol. II, pp. 942.

63 : 631.445.7 MASEFIELD, G. B.
A Handbook of Tropical Agriculture. Clarendon Press, Oxford. 1949. Pp. viii + 196. 12s. od.

631.4 : 635 BEAUMONT, A. B.
Garden Soils. Their use and conservation. Orange Judd Publ. Co., Inc. New York. 1948. Pp. 280. $3.50.

631.414.2 : 549 BOSAZZA, V. L.
The Petrography and Petrology of South African Clays. Percy Lund, Humphries and Co. London. 1948. Pp. xv + 313. 42s. od.

631.415.3 KOVDA, V. A.
[Origin and Regime of Saline Soils.] Dokuchaev Soil Institute of the Academy of Science of the USSR, Moscow-Leningrad. 1946. Pp. 568. [R.]

631.417.2 ALBAREDA, J. M.
Origen y Formacion del Humus. [Origin and Formation of Humus.] Consejo Superior de Investigaciones Cientificas, Madrid. 1948 [?] Pp. 92. 10 pesetas.

631.452 MALHERBE, I. DE V.
Soil Fertility. Oxford University Press. 1948. Pp. xii + 296. 21s. od.

631.459 FURON, R.
L'Érosion du Sol. [Soil Erosion.] Payot, Paris. 1947. Pp. 218. Fr. 360.

631.459 : 631.61 COX, J. F.; JACKSON, L.E.
Crop Management and Soil Conservation. Wiley and Sons, N.Y. 2nd edition, 1948. Pp. 572. $3.80.

631.468.516 BARRETT, T. J.
Harnessing the Earthworm. Faber and Faber. 1949. Pp. xvi + 166. 12s. 6d.

631.811 ANDREWS, W. B.
The Response of Crops and Soils to Fertilizers and Manures. State College, Mississippi. 1947. Pp. 459. 23s. od.

631.811 : 636.084 CORRIE, F. E.
Some Elements of Plants and Animals—The Mineral Elements in Plant and Animal Nutrition. The Fertiliser Journal Ltd., London. 1948. Pp. 120. 8s. 6d.

632.954 BATES, G. H.
Weed Control. Farmer and Stockbreeder, (Spon), London. 1948. Pp. viii + 236. 16s. od.

633.4 MOORE, H. I.
Root Crops. Farmer and Stockbreeder, (Spon), London. 1948. Pp. viii + 175. 14s. od.

634.95 TOUMEY, J. W.; KORSTIAN, C. F.
Seeding and Planting in the Practice of Forestry. John Wiley and Sons, New York. 3rd edition, 1947. Pp. xxii + 520. 36s. od.

634.956.4-1.81 NĚMEC, A.
Hnojení Lesních kultur. [The fertilizing of forest nurseries.] Brázda, Prague. 1948. Pp. 216. Kčs. 72.

(4)63 OFFICE OF FOREIGN AGRICULTURAL RELATIONS
Agricultural Geography of Europe and the Near East. U.S.D.A. Office of Foreign Agricultural Relations. 1949. Pp. 67.

(42)63 STAMP, L. D.
The Land of Britain : Its Use and Misuse. Longmans Green and Co. 1948. Pp. 507. 237 illustrations. 42s. od.

(54)631.459 : 631.61 GORRIE, R. M.
Soil and Water Conservation in the Punjab. Government Press, Lahore. 1946. Pp. viii + 290. 7s. 6d.

[595)633.74 CHEESMAN, E. E.
Report on potentialities for the cultivation of cocoa in Malaya, Sarawak, and North Borneo. Colonial No. 230, H.M.S.O. 1948. Pp. 44.

(61)631.4 DEL VILLAR, E. H.
Types de Sol de l'Afrique du Nord. [Soil types of North Africa.] Rabat. Fasc. I., 1947. Pp. 136. Fasc. II., 1948. Pp. 137-288.

(624)63 TOTHILL, J. D. (EDITOR)
Agriculture in the Sudan. Oxford University Press. 1948. Pp. 974. Maps. 42s. od.

(64)631.4 : 631.67 BRYSSINE, G.
Étude préliminaire des sols du périmètre irrigable des Srarhna. [A preliminary study of the soils of the irrigable perimeter of Srarhna.] Serv. Rech. Agron. Expt. Agric. Rabat. 1948. Pp. 52, 3 maps, 6 plates.

(931)631.459 CUMBERLAND, K. B.
Soil Erosion in New Zealand. Whitcombe and Tombs, Auckland, N.Z. 2nd edition, 1947. Pp. 228 + 60 photos and 2 maps.

INDEX TO AUTHORS

SOILS AND FERTILIZERS

Vol. XII 1949 No. 4

THE STALIN PLAN FOR RUSSIAN AGRICULTURE

A grandiose 15-year plan for the reorganization of land use in the semi-arid region of the European part of the U.S.S.R. is revealed in a decree dated October 20, 1948, issued by the Council of Ministers and the Central Committee of the Communist Party of the U.S.S.R. The (translated) title of the decree is "On the Plan of Protective-Forest Planting, Adoption of Crop Rotations with Leys, and Digging of Ponds and Reservoirs to Ensure High and Stable Harvests in the Steppe and Forest-Steppe Areas of the European Part of the U.S.S.R." For short, it is called the Stalin Plan.

According to *Pravda* the region concerned embraces about 80,000 collective farms and some 120,000,000 hectares (300,000,000 acres). Rainfall is of the order of 10-20 inches a year. In some parts of the region severe droughts can be expected in one year out of three, in others in one year out of four, and in most of the rest in one year out of six. Wind and water erosion is common and in places far advanced. The decree ordains that certain general measures, outlined below, shall be carried out over prescribed areas in the next five years and that the entire plan shall be completed in fifteen years. At the end of that time drought and soil erosion shall have been completely abolished.

Beginning in 1949, all state and collective farms in the steppe and forest-steppe region must begin to develop a planned agriculture based on the ideas of Dokuchaev, Kostychev and Williams and known as the grass-rotation (*travopolnaya*) system. This system requires

(a) planting of protective forest belts on watersheds, along the boundaries of crop-rotation fields, on the slopes of gorges and ravines, on the banks of rivers and lakes, around ponds and reservoirs, as well as afforestation and fixation of sandy areas ;

(b) a correct organization of the territory with the introduction of rotations of food and fodder crops as well as rational utilization of the arable lands ;

(c) a correct system of soil cultivation, with proper care of the crops and primarily the adoption of widespread fallow ploughing, autumn ploughing and stubble cultivation ;

(d) a correct system of application of organic and mineral fertilizers ;

(e) sowing with selected high-yield seed varieties adapted to local conditions ;

(f) development of irrigation on the basis of the utilization of the local water flow by digging ponds and reservoirs.

Although it is clearly impossible to get statistically reliable evidence in a short time of the superiority of the grass-rotation system over the usual system (?grain-fallow), individual examples are cited in which markedly higher yields were obtained where the Dokuchaev-Williams line was followed than where the traditional system prevailed. Thus the Gigant State Farm, near Rostov, reports average yields of winter wheat on fields protected by forest strips of 2.5 tons per hectare (one ton per acre).

One of the most impressive features of the plan is the programme for establishing large shelter belts of different selected tree species. The major shelter belts to be planted in the period 1950-65 include :

A state forest shelter belt from Saratov to Astrakhan on both banks of the River Volga, 100 metres wide and 900 kilometres long.

A 600-kilometre state forest shelter belt in the direction Penza-Ekaterinovka-Veshenskaya-Kamensk on the Northern Donets, on the watersheds of the Rivers Khoper and Medveditsa, Kalitva and Berezovaya, consisting of three strips, each

up to 60 metres wide with 300-metre gaps in between.

A 170-kilometre state forest shelter belt in the direction Kamyshin-Stalingrad, on the watersheds of the Rivers Volga and Ilovlya consisting of three strips, each 60 metres wide with 300-metre gaps in between.

A 580-kilometre state forest shelter belt in the direction Chapayevsk-Vladimirovka, consisting of four strips, each 60 metres wide with 300-metre gaps in between.

A 570-kilometre state forest shelter belt in the direction Stalingrad-Stepnoy-Cherkessk, consisting of four strips, each 60 metres wide with 300-metre gaps in between.

A 1,080-kilometre state forest shelter belt in the direction Mt. Vishnevaya-Chkalov-Uralsk-Caspian Sea, on the banks of the Ural River, consisting of six strips (three on each side of the river), each 60 metres wide with 100-200-metre gaps in between.

A state forest shelter belt in the direction Voronezh-Rostov-on-Don on both banks of the River Don, each 60 metres wide and 920 kilometres long.

A 30-metre wide and 500-kilometre long state forest shelter belt on both banks of the River Northern Donets from the town of Belgorod to the River Don.

These represent, besides the belts along the courses of the main rivers, four major, roughly parallel and interlocking belts stretching across the steppes from north to south.

Responsibility for carrying out this programme rests with the Ministry of Forestry.

It is further decreed that the whole region should be divided into rectangles, apparently about 80 × 40 sq. km. in area, running north and south and surrounded by protective forest strips, the establishment and maintenance of which will be mainly the task of the collective farms. These belts seem to be 60 metres wide, and their total area will be 5,709,000 hectares. In association with the afforestation plans there are complementary plans for establishing and mechanizing a large number of nurseries up to 200 hectares in area to provide millions of seedlings each year of some scores of different tree species specifically recommended for the nineteen main soil types of the region. Instructions are also issued for the mass production of nurserymen and foresters.

Perhaps the most interesting part of the decree from the scientific point of view is the insistence on the adoption of ley farming as the basic system of agriculture throughout the region. The execution of the decree might, indeed, be regarded as the putting into practice on a huge scale of the agricultural principles evolved by the late Prof. V. R. Williams and now regarded as the infallible gospel of agriculture throughout the Union (see *Soils and Fert.* XII, pp. 69-71).

Williams's book in which he propounds his gospel is now available in English under the title "Principles of Agriculture" (Hutchinson, London). Williams regards agriculture as a single, indissoluble complex—as a kind of machine which transforms the energy of the sun into the food of mankind. The successful agriculturist is he who constructs the most efficient machine and operates it in the most economical manner. It is a basic part of his philosophy that the main limiting factor to agricultural productivity is the farmer. "There are not good and bad soils, but only good and bad agriculture." He considers such things as the law of the minimum and the law of diminishing returns as inventions of the bourgeoisie designed to mask the restrictiveness of an outmoded capitalist economy.

According to Williams, there are three essential "shops" in the agricultural factory, all of equal importance and inseparable from each other—crop husbandry, livestock husbandry and soil cultivation. The crop is the mechanism by which solar energy is converted into vegetation, only about a quarter of which, however, is suitable for human food. The function of livestock is to convert the remaining three-quarters into useful products, but again only about a quarter of the energy taken in by animals is converted into meat, milk, hides, wool, etc. Most of the remainder should be returned to the soil as manure

which, however, is useless until it is mineralized. The purpose of soil cultivation is to bring about the most complete and efficient decomposition of organic matter, and so complete the cycle with the minimum of loss and the maximum of useful production. The farmer who pays undue attention to any of these bases to the neglect of the others loses in efficiency, and his land loses in productivity.

The object of agriculture is to ensure a continuous and high level of production, this being a measure of the productivity of agricultural labour, and depends on the creation and maintenance of a high level of soil fertility. Soil fertility, in its turn, depends on the presence, throughout the growth of the crop, of sufficient quantities of the two terrestrial growth factors—moisture and nutrients—to enable the maximum use to be made of the solar growth factors—light and heat—in plant production. In physical terms this means the creation and maintenance of a stable crumb structure in the soil, supplemented, where necessary, by irrigation and fertilizing. Williams, indeed, defines an agricultural system as "a system of scientifically planned measures the purpose of which is to produce in the soil new amounts of active humus necessary for the creation of a stable crumb structure."

This is the central principle around which Williams designed his grass-rotation agricultural system which at the present time is being continuously and unreservedly praised in the Russian scientific and lay press, and is soon to be submitted to its supreme test in the Stalin Plan. It is a system which Williams himself always insisted must be adopted in its entirety if the results demanded by and achievable under a socialist economy were to be achieved. There is nothing novel about any of the separate features of the system, or in the manner in which they are integrated into a complete system. What is novel is that whereas most established agricultural systems have evolved over long periods by processes of trial and error, Williams's system has been developed from theoretical premisses (based, however, on practical experience), and is to be applied on an enormous scale, lock, stock and barrel, as Williams left it at his death in 1939. It is frankly as much a political as an agricultural project. Williams is the recognized apostle of the application of Marxism-Leninism (whatever that may be) to agriculture, and what he says goes unquestioned.

One of the most important parts of Williams's system consists in the "organization of the territory," i.e., planning the cropping system in relation to soils and topography. It is this feature of the system that has presumably given rise to the assertion that the Stalin Plan can only be carried out under a socialist economy; it would certainly have been impracticable with small-scale, unco-ordinated peasant holdings. Furthermore, the whole plan assumes throughout that God may propose, but Man will dispose, and that any dispositions God may presume to make during the execution of the plan can be ignored, together with any residual frailties the executors of the plan may have inherited from their capitalistic forefathers.

In enunciating the basic principles of land-use planning Williams takes a catchment as the unit. Watershed areas tend to be wet after rain, but liable to suffer from droughts in the surface soil which tends to be deficient in plant nutrients; these areas should therefore be kept in forest not only because the soil conditions suit tree growth, but also for purposes of soil conservation and water regulation. The soils of the bottom lands tend to be permanently moist and rich in plant nutrients, and the soils of the slopes midway between those of the watershed and the valley.

All the cultivated land must be put under some kind of grass-arable rotation. Williams distinguishes two types of such rotations, each of which has its proper place in the organization of the territory—the "field" rotation which should be located mainly on the higher parts of the relief and slopes, and the "fodder" rotation suitable for low-lying and bottom lands and the slopes of ravines and gullies. The field rotation consists of annual crops with relatively small nutrient and water requirements, and the necessary ley should not occupy the ground for more than 2-3 years in the rotation. When once a soil structure has been created and only requires to be maintained, a one-year ley should suffice, but it must be of perennial

species. The fodder rotation includes a longer (3-6-year) ley and cereal, vegetable and industrial crops with high nutrient and water requirements. Both kinds of rotation are capable of wide variation to suit local conditions and the overall government plan, but the grass break may not be varied. In the field rotation the grass break is a kind of unavoidable evil necessary for the restoration of the structural stability of the soil. In the fodder rotation, on the other hand, the cultivation of perennial grasses is the pivot round which the whole rotation turns. Its main purpose is to provide a fodder base for livestock. However, the mostly high-priced and exacting crops grown in the arable break of the fodder rotation are well adapted not only to make good use of the abundance of plant nutrients released when the ley is ploughed up, but also to compensate the collective farm for the comparatively low cash return obtained from the long ley.

The decree lays much emphasis on the importance of a correct system of soil cultivation according to Williams's principles, which require the scuffling of stubble immediately after harvest as a means of destroying weeds, followed by autumn ploughing to a depth of 20-22 cm. (8-9 inches). This ploughing must be done with a mouldboard plough furnished with a special kind of skim-coulter, known as a fore-plough (*predpluzhnik*), the purpose of which is to cut off the top 10-cm. layer of soil and to throw it to the bottom of the furrow where it is covered by the second 10-cm. layer of soil which is thus brought to the surface. The purpose of this operation is to create anaerobic conditions in the former surface soil so as to kill off weed seeds and overwintering insect and fungus pests, and to allow humus to accumulate, while in the new surface (former subsoil) layer strongly aerobic conditions will prevail, causing rapid decomposition of the humus previously accumulated under anaerobic conditions, the liberation of plant nutrients and the formation of a crumb structure ready for the next year's crop.

In many other semi-arid countries the tendency nowadays is to recommend non-ploughing methods such as trash farming. During the war some evidence was obtained in the Middle East that deep ploughing of semi-arid to arid land resulted in one or two exceptionally good crops of wheat or barley, followed by a precipitate fall in yield. Whether or not the same thing happens in Russia, or whether the fall can be prevented by ley farming or other fertility-conserving measures remains to be seen.

Stubble cultivation followed by deep autumn ploughing with the aid of a fore-plough are the chief measures of cultivation insisted on, but there are several others to be used according to the conditions. Bare fallowing is to be used more extensively, e.g., on 3,000,000 ha. in 1950 and on 9,000,000 ha. in 1955, as a means of conserving soil moisture. The wholesale adoption is ordained of measures, such as the erection of shields, for increasing snow retention. This has long been advocated and is apparently already widely practised on scientific lines in the steppe region. Indeed, snow retention is one of the main reasons given for the establishment of protective forest strips, and it is probably in this way that they will mostly justify the cost and labour of their establishment.

Experience of windbreaks outside Russia does not justify the assumption that they can significantly modify the water regime of the soil beyond a distance of 100 metres or so from the windbreak. A zig-zag form is found much more effective than the straight form envisaged in the plan. In America great store is set on the psychological effect of windbreaks especially near dwelling places, but, judging by the published map of the proposed shelter belts, this aspect appears to have been ignored in the Russian plan. American experience also is that in general a satisfactory shelter belt cannot be produced with a rainfall of less than 15 inches a year.

A great deal of ballyhoo has been associated with the launching of this plan, and it is difficult to make an objective estimation of the prospects for its successful fulfilment. When one is dealing with 300,000,000 acres most other figures will run into millions, and the total effect of the figures is impressive. They do not, however, tell much. Indeed, the figures for ponds and reservoirs to be built, and for the areas to be irrigated and afforested under the Stalin Plan are only a fraction of the corresponding figures for what

has actually been done in the last two decades in the United States which nevertheless still suffers from drought and soil erosion. Some people would say that the Russians are pinning too much faith to the efficacy of shelter belts (possibly because they make a bold show on the landscape), and that while a tremendous effort is going to be put into the provision of trees, the provision of livestock to cope with the greatly increased area under grass has been completely ignored in the plan. It looks as though somebody has slipped up there. Williams would not have liked it at all. He always insisted on the equal importance of arable farming, livestock farming and soil cultivation. Nevertheless, something is almost bound to come out of the plan, and in view of the immense amount of attention now being given throughout the world to ley farming as a basis of permanent agriculture, the unfolding of the Stalin Plan will be followed with interest.

WEED CONTROL

(*Weed Control. By G. H. Bates. E. and F. N Spon, London.* 1948. *Pp.* viii + 236. *Price* 16s. 0d.)

Books on weeds usually approach the subject from one special point of view. They may, for instance, be largely descriptive or deal chiefly with methods of eradication. The object of this work, however, is, in the words of the author, to discuss and review weed control in all its aspects. Dr. Bates's aim is, in fact, to put the whole matter in proper perspective by studying it from an ecological point of view, thus throwing light both on the nature of the problem and also on the best means of solving it.

Emphasis is laid on the need for control at the source, by the use of clean seed and proper attention to cultivations of the right kind at the right time, and to rotational cropping. Mechanical processes are discussed in some detail and methods for the eradication of "twitch" described. This weed serves as an excellent example of the author's maxim that only by an ecological as well as morphological study of the plant can means be successfully devised for its suppression.

Two chapters are devoted to chemical methods of control and the appliances designed for their use. The substances described include both the older type of sprays, such as copper compounds, sulphuric acid and D.N.O.C. and the newer hormone weed killers. A table is given comparing the efficiency of each for a number of common annual weeds, and much practical advice on the use and care of spraying machinery is provided. It is recognized that weeds are not the concern of the farmer only, and the problems that confront the horticulturist, the water engineer, the railway and canal authorities are not overlooked, and a final chapter deals with poisonous weeds. The book should, therefore, appeal to a wide circle of readers as it is a fund of practical information presented in a most interesting manner. With regard to nomenclatures, however, it would be preferable if, in future editions, the more common usage of the small letter for specific Latin names could be adopted throughout. K. WARINGTON

BRITISH VEGETATION

(*Britain's Green Mantle. By A. G. Tansley. Allen and Unwin, London.* 1949. *Pp.* xii + 294 *Price* 18s. 0d.)

This is an account, historical and contemporary, of what the author calls the "semi-natural" vegetation of the country with the most beautiful man-made scenery in the world. Prof. Tansley describes the evolution of vegetation in Britain from the end of the Ice Age to the present time, with special reference to the part played by man during the last 2,000 years. Man has changed the "natural" vegetation of mainly deciduous

forest into a "semi-natural" vegetation of mainly grassland with a little secondary forest, heath, cultivated fen, etc. There are also, of course, considerable areas of what Tansley calls "artificial" vegetation—cultivated crops—but these he purposely ignores. He is not the only ecologist to distinguish between natural and artificial vegetation. Agricultural ecology will have advanced a great step forward when cultivated plants are regarded just as much organic parts of a natural community of which man is the dominant species as woodland plants are regarded as organic parts of a forest. Tansley, however, regards arable crops as artificial communities whose dominants are the crop plants and the associated species are the weeds. They are strange dominants which cannot hold their own, unaided, in the communities they "dominate."

The plant-ecological history of England under human occupation is the story of the conquest of forest by arable fields, followed by the conquest of arable land by pasture, with occasional temporary reconquests by arable and forest in response to economic circumstances. Recently, both have made appreciable advances at the expense of grassland, but since the end of the war there has again been a slight trend towards an increase in the total area under grass. Britain has always been a livestock country. At one time in the fourteenth century it contained half as many sheep as people.

The description of the main types of British vegetation are admirable examples of how plant associations should be described so as to maintain the interest of the layman and a high standard of scientific accuracy. Four pages are devoted to the complementary science of pedology—just four pages more than would have been devoted to plant ecology in a book on British soils. There is, however, ample material here to help the pedologist in his capacity as student of the physical and biotic environment.

In the last chapter Tansley speculates on the future of the Green Mantle. He anticipates that much formerly permanent grassland will give place to temporary grassland of higher productive capacity and alternating with arable. As a plant ecologist he considers that "considerable areas of the old rough grazings . . . should not be interfered with, for they . . . contain many interesting plants." Some heaths, beechwoods and chalk grasslands should also be preserved for their ecological interest. The Forestry Commission is censured for its policy not only of planting much hill grassland and moorland, but also of replanting former deciduous woods with conifers. Tansley's objection to conifers is mainly aesthetic, though he believes that they may bring about a deterioration in soil conditions when grown outside their natural environment. He would confine conifers to the north and north-west and would have the forests run on a sustained-yield basis, but he is perhaps optimistic in believing that such forests could actually "produce an ample supply of softwoods" for Great Britain.

SUMMARY OF REPORTS

Reports received include: *Australia*, Bureau of Sugar Experiment Stations, Queensland, Review of Year's Work and Field Trials 1948 [in Cane Grower's Quarterly Bulletin 12, 1949 (103-124)]; *British Guiana*, Department of Agriculture Report 1946; *Canada*, Report of Science Service, Dominion Department of Agriculture Report 1947-148; Progress Reports of Dominion Experimental Farms, Agassiz, B.C. 1936-47, Brandon, Manitoba 1937-47, Harrow, Ont. 1937-46, Kentville, N.S. 1937-46, Lethbridge, Alta, 1937-46, Melfort, Sask. 1936-46, Regina, Sask. 1937-46; Department of Trade and Commerce, Grain Research Laboratory, Winnipeg, Report 1948; *Ceylon*, Tea Research Institute Report 1947 (Bull. 29); *Colonial Office*, Colonial Annual Reports 1947 for Bechuanaland Protectorate, British Honduras, Fiji, Jamaica, Leeward Islands, Malayan Union, Swaziland and Uganda; *Holland*, Landbouwproefstation en Bodemkundig Instituut T.N.O. Groningen 1946; Instituut voor Toegepast Biologisch Onderzoek in de Natuur, Oosterbeek 1948; *Kenya*, Department of Agriculture Report 1947; Department of

Veterinary Services Report 1947; *Southern Rhodesia*, Annual Reports of the Government Farms 1947; *Scotland*, West of Scotland Agricultural College, Glasgow Report 1947-48 and Guide to Auchincruive 1948; *South Africa* Department of Agriculture Report 1947-48 [Farming S. Africa 24, 1949 (39-170)]; *Switzerland*, Reports of Federal Vine, Fruit and Agricultural-Chemical Experimental Stations at Lausanne and Pully [Landw. Jahrb. Schweiz 62, 1948 (555-660)]; *Tanganyika Territory*, Sisal Experimental Station Report 1947; *Uganda Protectorate*, Department of Agriculture Report 1946-47; West African *Cacao Research Institute, Tafo*, Quarterly Report July-September 1948; *Wye College*, University of London, Department of Hop Research Report 1948; *United States Experiment Stations*. *Colorado* 1947-48; *Georgia Coastal Plain* 1947-48; *Hawaii* 1946-48; *Illinois* 1938-47; *North Carolina* 1947; *New York State* 1948; Federal Experiment Station, *Puerto Rico* 1948; *Utah* 1946-48; *Wyoming* 1947-48.

Australia.—*Bureau of Sugar Experiment Stations.*—Methods of applying Gammexane for grub control. Investigation of lime requirements of acid soils. Green-manuring improvement.

British Guiana.—Effect of pen manure on single and double cropping of rice on new and old land. Ploughing trials on new and old rice land. P fertilizers and lime and organic manures for sugar.

Canada.—*Science Service, Dominion Department of Agriculture.*—Distribution of micro-organisms in rhizosphere and rhizosphere effects of different plant crops. Azotobacter as fertilizer for cultivated plants. Soil micro-organisms in relation to Mn deficiency and to potato scab. Effect of soil temperature on development of *Helminthosporium* blight of oats; disease was most severe at high temperatures. Fertility needs of neglected and run-down orchards; reclamation of saline soils. Composition of the colloidal fraction of soils. Chemistry of soil organic matter and determination of uronic-acid content of various colloidal humate fractions isolated from different soils. Minor-element content of Ontario soils. Soil phosphates. Soil mineralogy.

Agassiz B.C. Experimental Farm.—Long-term fertilizer trials with manure, super. and $(NH_4)_2SO_4$ at different seasons. Yields of oats and clover following mangels. Crop rotations, irrigation and fertilizers for vegetables. Comparison of 3-, 6-, 8- and 10-year rotations.

Brandon, Manitoba Experimental Farm.—Fertilizers, manures and green manures for wheat, maize and barley on light loam soils. Ploughing-under sweet clover at various stages of growth compared with grass and lucerne hay land and bare fallow for grain crops on heavy clay loam. Cultural treatment for summer fallow.

Harrow, Ont. Experimental Farm.—Tobacco seed-beds; sterilization and fertilizers. Methods of applying fertilizers, cultural practices and rotations for tobacco. Fertilizers for tomatoes and asparagus.

Kentville, N.S. Experimental Farm.—Fertilizers for orchards; source of N and time of application. Determination of value of ground limestone in conjunction with fertilizers and effects on yields of wheat, clover, mangels, swedes and potatoes. Effect of B on yields of wheat, clover, mangels and swedes; effect on yields of different sources of N and P with and without lime or B. Effect of limestone and B on disease in mangels and brown-heart in swedes. Effect of fertilizers on composition of herbage and protein content of pastures. Effect of tapping slag on different soil types which responded and did not respond to limestone. Effect of slag on soil at different moisture levels and on yield of oats, swedes and clover.

Lethbridge, Alta. Experimental Farm.—Ploughless tillage, fertilizers and rotations for dryland. Rotations and soil-drifting control on irrigated land. Moisture content of soil in weedy and non-weedy land. Chlorosis in strawberry and tree fruits due to Fe deficiency. Re-grassing abandoned farm land. Effect of fertility and bacterial wilt on yields of lucerne. Cropping systems and rotations for Prairie farms. Crested

wheat grass for restoring soil fibre. Cultural treatments for summer fallow. Erosion control.

Melfort, Sask. Experimental Farm.—Response of wheat to fertilizers at different rates on summer fallow and stubble; response to different P fertilizers and to rotted and fresh manure. Rates and kinds of fertilizers for barley, oats, lucerne and brome grass. Effect on wheat yields of different treatments of summer fallow land. Rotations for wheat, oats, barley, hay and lucerne. Plant-food deficiency studies on grey wooded soils. Chemical fertilizers as supplement to farm manure for wheat.

Regina, Sask. Experimental Farm.—Soil-drifting control; tillage and ploughing in summer-fallow year; cover crops and spreading straw; strip farming; crop rotation. Control of wild mustard by crop rotation. Rates of application and place in the rotation of fertilizers. Effect of rates and date of seeding on response of wheat to fertilizers.

Ceylon.—*Tea Research Institute.*—Availability and mobility of soil phosphates; penetration of super. in a tropical red earth. Cultivation and weeds; gain or loss of crop due to weeds; gain and loss in response to fertilizer of clean-weeded and selectively-weeded plots; effect of intensive cultivation on clean-weeded and selectively-weeded plots.

Holland. — *Groningen.* — Soil structure; aggregate analysis, pore-space measurement, use of dynamometer; binding of soil particles; sandy soils. Study of *rodoorn* soils (clays with some iron hydroxide) and sandy soils. Estimation of Fe, K and exchangeable bases in soils. Soil and drainage conditions of polders; soil permeability and movement of water in soils; evaporation from polders; distribution of moisture above ground-water level. Effect of soil structure on K manuring of heavy, marine clay soil. Liming experiments on heavy, marine clay and sandy valley soils and on clay meadows; effect of Mg status of soils. Effect of Cu content of soil on grass species. Effect of soil type, liming and application of slag on the Mn content of grass; Mn deficiency on oat-sick, reclaimed marsh soils. Seasonal fluctuations in soil pH, P and K contents. Salt content of canals, ditches and soils of land inundated with salt water; content of exchangeable Na; effect of gypsum, lime and NPK. Effects of N, P and ground-water level on mustard. Relationship between soil profile and root systems and between soil pH and root development; effect of liming and depth of cultivation. Soil fertility and botanical composition of sward. Nitrification in acid soils.

Oosterbeek.—Function of soil fauna in forest ecology. Windbreaks and drifting soils.

Kenya.—Fertilizers for coffee; effect on dieback, quality of crop and earliness of ripening; foliage tests for uptake of nutrients; mulching. Soil-moisture measurement; improvement of the calibration of Bouyoucos plaster-of-Paris blocks. Cultivation and weed control in coffee. Soil and land-utilization surveys. Tana River irrigation project. Soil structure; measurement of aggregation of soil particles. Manufacture of silicophosphate.

Scotland.—*West of Scotland Agricultural College, Auchincruive.*—Phosphate trials on swedes. Effect of liming on the botanical composition of grassland.

South Africa.—Lysimeter studies on problems of brak soils. Soil-erosion control and reclamation. Irrigation experiments with wheat in rotation with cowpeas, and with limited irrigation and kraal manure on maize followed by field peas. Organic-matter depletion in soils. Studies in agro-climatology. Veld-management and reclamation studies. Long-term field experiments on crop rotations for winter-rainfall areas. Immobilization of P in soil; residual effects of super. and local rock phosphate on legumes in orchards. Mn deficiency in peaches and avocado. Studies on Mn/Fe ratios, nitrification and ammonification. Toxic effect of Mn in soils. Fertilizer experiments with grassland, citrus and grapes.

Switzerland.—Fertilizer trials with vines, fruit trees, acid alpine grassland, grassland on calcareous soils and oats on a reclaimed peat. Persistence of phytohormones in soil.

Tanganyika Territory.—*Sisal Experimental Station.*—Fibre yields and soil texture. Cultivation trials with clean weeding, weeding twice annually, cover crop, weed cutlassed and uncontrolled weeding. Manurial trials on healthy sisal and plants suffering from banding disease.

Uganda.—Investigations on the destruction of termite mounds. Fertilizer trials with local rock phosphate, silicophosphate, $(NH_4)_2SO_4$ and K_2SO_4. Fertilizer experiments with cotton, groundnuts, bananas and elephant grass. Cultivation experiments with and without fertilizers. Thornscrub eradication by burning. Shade and mulch observations of coffee.

West African Cacao Research Institute.—Influence of methods of application of P fertilizers on bearing cacao.

Wye.—Cultivation trials using ploughing to 2 inches and to 6 inches in different seasons. Effect of N fertilizers on *Verticillium* wilt. Importance of lime in hop growing.

United States Experiment Stations

Colorado.—Comparison of 14 different fertilizer placements on sugar beet. Rotations for sugar beet. Restoration of levelled and eroded soil. Effect of moisture stress on growth of sugar beet at two levels of fertility.

Georgia.—Harvesting of groundnuts. Fertilizers for cotton, maize, oats, groundnuts, tobacco and sweet potato. Control of root knot in tobacco seed-beds and fields. Methods of applying soil fumigants.

Hawaii.—Increased yield and proportion of clover in pasture legumes following application of P; indications of response to K. Lime-requirement of Hawaiian soils. The Ca : Mg ratio and availability of K in Mg-clay soils. Soil Mn and the Mn cycle. Movement and availability of N in soils. Co and Mo content of Hawaiian soils and plants. Chemical determination of Ni in plants and soils. Distribution of exchangeable P in soil profiles. Chemical composition of forest floors. Fertilizers for coffee suffering from die-back disease.

Illinois.—Influence of soil and management on water conservation and yields of maize. Increase of protein content of maize by applications of N. Isolation of soil antibiotic-producing fungi and bacteria.

North Carolina.—Soil treatment with DDT against wireworms. Lime and fertilizers for lespedeza. Legume cover crops for increasing groundnut yields. Lime and landplaster as fertilizers for groundnuts. Fertilizers for tobacco. Soil fumigants for root-knot control. Mg applications to soil for grape chlorosis. Mulching of grapes promotes growth, but encourages disease. P fertilizers produced better-quality hay for sheep. Rotation of kudzu with maize on eroded land.

New York State.—Control of Japanese-beetle larvae in soil with DDT and other insecticides. Effect of fertilizers on growth, productivity and quality of grapes. Placement of fertilizers for tomatoes on loam soil. Effect of N, P and K on yield of carrots. Effect of side dressings of N on snap beans. Rates and methods of application of fertilizer for sweet corn. Comparison of different sources of N, P and K and 3 rates of fertilizing and fertilizer placement on yield of vegetables. Comparison of fertilizer carriers, soil amendments and methods of application on incidence of root rot and yield of peas. Effect of rotations on incidence of root rot, quality and yield of peas and on fertility level and structure of the soil. Relationship between rates of seeding and fertilizer practices on commercial grades and net returns of beets. Comparison of various N fertilizers and inoculation of peas in controlling root rot. Relationship of soil type, drainage, fertility level and cropping systems to the incidence of pea diseases, and the effects of these various factors on yield and quality of peas.

Puerto Rico.—Cu and Mn for correcting chlorosis on well-drained clay soil; Fe increased chlorosis. Mulching of *Derris*. Treatment with D-D mixture and chloropicrin for disease in *Cinchona* nurseries. Fertilizer value of coco peat. Trials with tobacco on steep slopes. S deficiency. Lime and P treatment for hill pastures. Mulching and lime for vanilla. Fertilizer for ginger and bamboo.

Utah.—Fertilizers for dryland wheat. Autumn ploughing, early seed-bed preparation. Lining of canals with clay to prevent seepage. Development of soil-sampling machine to procure undisturbed care of soil. Effects of tillage, smother crops and chemicals on root reserves of perennial weeds. Chlorosis and related mineral-deficiency diseases of horticultural crops. Influence of cover crops, fertilizers and moisture supply on yield and grade of fruit. Influence of alkali salts on infection and nodulation of lucerne by *Rhizobium meliloti*. Value of Cu as fertilizer in Utah soils. Interrelationship between composition of soil and plants and nutrition of animals and man. Leaching and drainage of impaired Delta-area soils. Use of liquid P_2O_5 as fertilizer. Drainage of waterlogged and alkali lands. Effect of various soil-moisture stresses and fertility levels on yield and quality of sugar beet.

Wyoming.—Need for N and P on sugar-beet soils. Comparison of yields from 15 rotations involving spring and winter wheat. Comparison of 9 sugar-beet rotations; N and P fertilizers for sugar beet. Ammonium nitrate improved hay yield.

ABSTRACT SECTION

Note.—A capital letter in square brackets following the reference denotes the language in which the paper is written. A small letter denotes a summary in another language, e.g. [G.e.]—German, with English summary. English [E.] is only indicated for papers published in journals usually written in foreign languages. Where the Bureau has only seen an abstract, and not the original paper, no language indication is given.

Original (untranslated) titles of papers are only given where the Latin script is used.

Where more than one reference is given, the first is to the original paper, the others to notices in abstract journals. A key to the abbreviations used in the references is contained in the Bureau's *Bibliography of Soil Science, Fertilizers and General Agronomy.*

631.3 AGRICULTURAL EQUIPMENT

(*See also* Abs. No. 1363)

[1161] 631.333

Camuglia, G. **A simple fertilizer distributor for attachment to a tractor.** *Proc. Queensland Soc. Sug. Cane Tech.* 16, 1949 (129-131).

The distributor differs as follows from the one described previously (*ibid.* 14, 1947, p. 209): there are two rollers instead of one; the channels in the rollers are parallel instead of spiral; it is designed to be drawn by a high-clearance tractor, so that two sides of one row only are treated and not one side of each of two rows. One big advantage is that when the clutch is thrown out at the headland no further fertilizer is fed through. This machine can also be used for the application of gammexane and almost certainly for the inter-row planting of legumes.

[1162] 631.347.24

Farm Mechanization. **Artificial rainfall.** *Farm Mech.* 3, 1949 (51-52).

Methods of irrigation are reviewed; reference is also made to the incorporation of nutrient solutions in irrigation water.

631.4 SOILS

[1163] 631.4

Blanck, E. Genetische Bodenlehre. [**Soil genetics.**] *Z. PflErnähr. Düng.* 41, 1948 (201-206). [G.] [Göttingen].

A plea for the study of soil from the point of view of its origin, formation and natural constants rather than of its immediate properties as a medium for crop and stock raising. Soil genetics aim at a more fundamental approach to soil problems.—K.S.

[1164] 631.4 : 551.41

Mosolov, V. P. [**Topography and agricultural problems.**] *Dokl. Akad. S.-Kh. Nauk* No. 8, 1948 (3-22). [R.]

The relation of slopes to soil moisture, snow cover, temperature, vegetation, weed growth, crops, pests, crop varieties and cultivation methods is discussed, and a detailed study of slopes in relation to agriculture is recommended.

631.41 SOIL CHEMISTRY

(*See also* Abs. Nos. 1240, 1390)

[1165] 631.411.4 : 631.432.21

Veenenbos, J. S. Bodemkartering en de verdrogingsverschijnselen in het randgebied van de Noordoostpolder. [**Soil mapping and drying-out phenomena on the border of the north-east polder.**] *Maandbl. LandbVoorlD.* 1948 (340-344). [Du.]

Dry patches in grassland were investigated. The soil has a 3-metre-thick peat layer over a sandy subsoil and is covered by a clay surface soil 30 cm. in thickness. Two types of peat are distinguished, reed or sedge peat and sphagnum peat. The clay overlying sedge peat dries quickly, but that overlying sphagnum peat can remain moist for a long period, the sphagnum peat acting as a sponge. When water again becomes available there is contact between the sphagnum peat and the clay, and the drying process is reversed. The sedge peat however cannot swell up sufficiently to make capillary contact with the clay and the drying-out is irreversible.—K.S.

[1166] 631.414

PURI, A. N.; BHARIHOKE, G. **Soils and theory of colloidal behaviour: I. Insoluble acids and bases.** *Soil Sci.* 67, 1949 (331-344). [Field Res. Sta., Bombay]

Insoluble acids like stearic, palmitic, myristic and cilicic acids and silicates and $Al(OH)_3$ can be obtained in a state of molecular dispersion. Though filtrable, the precipitates react with alkalies in stoichiometric proportions. These substances thus precipitated may be said to have 100% active mass, with a moisture content ranging from 100% with stearic acid to 2000% with $Al(OH)_3$. When their moisture content is reduced below a critical value, aggregates form, reducing the exposed surface and the active mass. The relation between moisture content and active mass is smooth and is susceptible of a simple explanation which makes it unnecessary to bring in the phenomenon of "adsorption".—From authors' summary.

[1167] 631.414.05 : 631.434

GOY, S. Betrachtungen über den Dispersionsgrad der Böden und einige Bodenuntersuchungsmethoden. **[Degree of dispersion of soil and certain soil-testing methods.]** *Z. PflErnähr. Düng.* 40, 1948 (1-14). [G.]

Methods of electrometric soil titration are compared with other methods of determining lime requirement. There is no need to determine Ca data accurately for a natural soil at its momentary degree of dispersion, since the crumb status is always changing and with it the lime requirement. Application of total lime requirement estimated at complete dispersion results, however, in overliming because there is always a certain amount of aggregation in the field. The soil need only be brought to a pH range favourable to plant growth. Electrometric titration does, however, by the method of the end-point diagram, allow determination of lime requirements for partial as well as for complete dispersion, so that it is possible to calculate lime requirement at any particular degree of dispersion. Electrometric titration can also indicate the actual level of the plant nutrients on the soil. The expression "degree of dispersion" or "state of aggregation" is defined as the percentage of the total adsorption surfaces which are free at the particular state of aggregation, i.e. which are capable of being influenced by external factors. The smaller this number the greater is the number of soil crumbs present.—K.S.

[1168] 631.414.1

KIRKHAM, D.; FENG, C. L. **Some tests of the diffusion theory, and laws of capillary flow, in soils.** *Soil Sci.* 67, 1949 (29-40). [Iowa Agric. Expt. Sta.]

When water moves horizontally into uniform air-dry soil from a source of free water, experiments show: (1) The flow does not obey the law suggested by diffusion theory. (2) The quantity moving into the soil in time t is given by $Q=At^{\frac{1}{2}}+a$. (3) The distance advanced by the wetted front is given by $x=Bt^{\frac{1}{2}}+b$. A, a, B, b are constants, of which A and B are expected to depend upon soil structure, and a and b are small.—H.L.P.

[1169] 631.414.2 : 549

BRINDLEY, G. W. **Crystallographic studies of kaolinite, halloysite and related minerals.** *Silicates Indust.* 14, (*Suppl.*) 1949 (147-150). [E.] [Univ. Leeds]

Metahalloysite is composed of kaolinite sheets superposed irregularly (cf. Brindley, Robinson and MacEwan, *Nature* 157, p. 225) and gives banded X-ray diffractions (cf. Brindley and Robinson, *Min. Mag.* 28, pp. 393-406). Kaolinite is triclinic and is identifiable by two separate diffraction lines at 4.12 and 4.17 A. An intermediate "fireclay mineral" commonly occurs (cf. Brindley and Robinson, *Disc. Faraday Soc.* 42B, pp. 198-205). Metahalloysite gives a slightly larger (001) spacing than the other 2 minerals, probably due to water inclusions.—D.M.C.M

[1170] 631.414.2 : 549

FAVEJEE, J. C. L. De mineralogische samenstelling van de kleifractie van Nederlandse grondsoorten. **[The mineralogical composition of the clay fraction of Netherlands soils.]** *Landbouwk. Tijdschr.* 61, 1949 (167-171). [Du.]

Brief mineralogical descriptions are given of illite, kaolinite, montmorillonite, glauconite and nontronite. It is suggested that the upper limit of size for the clay fraction for mineralogical definition should be 0.5μ. This would eliminate quartz, felspar and muscovite, and simplify the interpretation of X-ray diagrams. The clay fraction of the usual size (upper limit 2μ) has been named *lutum* in Holland.

[1171] 631.414.2 : 549.1
HAMILTON, R. Standaard-dehydratatie-curven en enkele toepassingen. **[Standard dehydration curves and some applications.]** *Landbouw* 20, 1948 (275-282). [Du.] [Hilversum]

Results obtained from the dehydration curves of the clay fraction of numerous tropical-soil samples are discussed and compared with those of X-ray analyses. Satisfactory agreement is shown between the two methods.

[1172] 631.414.2 : 549.623.93
YUSUPOVA, S. **[The characteristics of montmorillonite.]** *C.R. Acad. Sci. U.R.S.S.* 51, 1946 (631-634). Z.P.D. 38, 1947 (252).

Samples were kept for 1 year at day temperatures of 60° and night temperatures approximating those of summer and winter in Central Asia. The treatment changed the temperature of the first thermal effect from 125° to 158° as compared with the untreated sample, and X-ray study showed the absence of the 15 A line and the presence of the 7.12 A halloysite line. Two years of treatment, while producing similar thermal-analysis effects, caused an interference at 4.46 A instead of the 15 A line. Powers of adsorption and swelling were considerably lessened by treatment, were almost completely regained by the 1-year sample on treatment with water at room temperature for 6 months, but only to a slight extent by the 2-year sample. With a sample treated for 6 hours at 350° even boiling water caused no reversibility.

[1173] 631.414.2 : 631.425.5
HOOGHOUDT, S. B. Enige resultaten van de bepaling der gehalten van gronden aan lutumsubfracties (korrelfracties fijner dan 2µ). **[Some results of determining the amount of clay fraction (particles finer than 2µ) in soils.]** *MaandbI. LandbVoorlD.* 5, 1948 (355-357). [Du.] [Landbouwproefst. Bodemk. Inst. T.N.O. Groningen]

In order to obtain a complete picture of the particle-size distribution and to explain many physical properties of the soil, the fraction smaller than 2µ should be considered. A study of 60 Dutch soils shows considerable differences in the composition of this fraction, both in exceptional clays and ordinary agricultural soils. The desirability of extending this study is stressed. A relatively difficult workability was observed in soils where the fraction less than 16µ was small with respect to the fraction less than 2µ.

A table is given showing the content of fractions 2-16, 1-2, 0.5-1.0, 0.25-0.5, 0.125-0.25 and < 0.125µ for 19 Dutch soils of varying type.

[1174] 631.414.3 : 631.811
BOTTINI, E. I composti colloidali di adsorbimento del terreno in rapporto colla reazione e colgrado di fertilità chimica. **[The colloidal adsorbing compounds of soil in relation to reaction and degree of fertility.]** *Ann. Ist. Sper. Chim. Agrar. Torino* 16, 1946-1948 (63-87). [I.]

An investigation of ion exchange and of percentage saturation of 55 soils of pH 5.9-7.8 about which no other soil data are given. Percentage saturation with K, NH_4, NO_3 and PO_4 is calculated, and Mitscherlich's method was used to ascertain the uptake of N, K and P by plants. The plants tended to take up more P than was exchangeable. Exchangeable K generally tended to be more than sufficient for the plants' needs, and in most of the soils of pH above 7.2 was greatly in excess. No relationship is suggested between exchangeable N and plant uptake. No clear relationship emerged between pH and degree of saturation or ion ratios, except that with few exceptions the soils above pH 7.2 had the higher contents of exchangeable K and the higher percentage saturation with K (up to 80%). Soils below pH 7.2 tended to have larger values for NH_4-saturation (rarely over 30%). Only four soils were more than 10% saturated with PO_4, 2% saturation being more usual. Many of the soils were completely saturated with NO_3.—R.N.

[1175] 631.414.324 : 545.844
GAPON, E. N.; CHERNIKOVA, T. N. **[Chromatographic exchange adsorption of cations on soil minerals.]** *Dokl. Akad. S.-Kh. Nauk* No. 7, 1948 (26-28). [R.]

Chromatograms of exchangeable cations were formed by percolating columns of kaolin and bentonite with equimolecular solutions of Cu and Co ions. A blue-green zone with blue spots (Cu zone) appeared at the top of the column, and a pink zone (Co) lower down, indicating a differentially stronger exchange adsorption of Cu than of Co.

[1176] 631.415.1
SOUFFRONT, L. O. Algunos apuntes sobre el uso de la cal en los terrenos. **[Notes on the use of lime on soils.]** *Agric. Trop. Bogotá* 5, 1949 (45-58). [Sp.]

An outline discussion of the nature and causes of soil acidity, its effect on the availability of the common elements, its neutralization and a method for calculating the lime requirement.

[1177] 631.415.1 : 545.371
TÖDT, F. Untersuchungen über die kolorimetrische Bestimmung der Bodenreaktion und des Kalkbedarfs im Boden. **[Studies in the colorimetric determination of the reaction and lime requirement of soils.]** *Z. PflErnähr. Düng.* 37, 1946 (222-232). [G.]

A review of recent work referring mainly to errors caused in soil-pH determinations by the reaction of the indicator itself.

[1178] 631.415.3 : 581.192.6
ROWAAN, P. A. Zout- en chloorschade bij de verschillende gewassen. **[Salt and chloride injury in various crops.]** *Maandbl. LandbVoorlD.* 5, 1948 (290-299). [Du.] [Landbouwproefst. Bodemk. Inst. T.N.O. Groningen]

A review of the literature indicates that the problem of salt injury involves many ill-defined points, and the results obtained are often contradictory. The salt concentration of the soil or irrigation water cannot be considered alone, for other factors such as soil water content, buffer capacity, manures and ion content can affect the amount of salt damage. Directions for practices and cropping, however, can be constructed from the established facts. Of agricultural and horticultural crops, potatoes, peas, kidney beans, field beans, clover, onions, carrots, flax, hemp, buckwheat, tobacco, yellow lupin, tomatoes, radishes, salads, cucumbers, gherkins, endives, chicory and salsify are very Cl-sensitive. Caution must be used in growing gooseberries, cherries, raspberries, plums, grapes, red currants and apples. As far as the Cl content of fertilizers is concerned, mainly the K salts have to be considered.

[1179] 631.415.3 : 631.67
KELLEY, W. P.; LAURANCE, B. M.; CHAPMAN, H. D. **Soil salinity in relation to irrigation.** *Hilgardia* 18, 1949 (635-665).

Investigations of the trend of salinity were conducted on irrigated soils in four Southern Californian counties over a 10-year period. The salinity of most of the soil areas examined is not increasing as a direct result of salts contained in the irrigation water. The salts thus added are displaced downward whenever sufficient water is applied and where drainage conditions permit deep penetration. Unless the irrigation water or the rains penetrate entirely through the root zone, soluble salts accumulate in that zone, and if Na exceeds 40 to 50% of the total bases and if the soil is free from gypsum, excessive base exchange will take place with the formation of more or less Na clay of low permeability which may lead to salinity increases in the root zone. Under such circumstances, applications of gypsum to the soil or to the irrigation water will be beneficial.

[1180] 631.415.36
HARPER, H. J.; PLICE, M. J. **Suggestions for improving slick-spot soils.** *Okla. Agric. Expt. Sta. Bull.* B329, 1949, pp. 8.

A slick-spot soil represents a retarded soil-forming process and usually the cost of improving it is greater than the increased value of the crops produced. Gypsum should be broadcast at 2-4 tons/acre. Covering slick spots with straw or other organic residues is helpful, or S may be added to improve the soil pH. P fertilizer should be applied and either N fertilizer or a legume crop is recommended. Soil should not be ploughed for at least 3 years after treatment.

[1181] 631.415.8
SCHMITZ, A. La répartition et la fréquence des plantes commensales des cultures en fonction du pH du sol en Belgique. **[The distribution and frequency of the commensal plants of crops in relation to soil pH in Belgium.]** *Bull. Inst. Agron. Gembloux* 15, Nos. 1-4, 1946 (18-78). [F.e.]

The frequency curve of individual commensal plants of crops is worked out in terms of soil pH, and plants are classified as indicators into acid-loving, neutral-loving, alkali-loving and indifferent. A practical method is recommended for determining the pH value of a cultivated soil from the examination of the flora.

[1182] 631.415.8 : 581.198
SMALL, J.; JACKSON, T. **Buffer index values in relation to soil-pH tolerances.** *Plant Physiol.* 24, 1949 (75-83). [Queen's Univ., Belfast]

To investigate the suggestion that the pH tolerances of plants are correlated with the buffer complexes of the plants concerned, the root saps of oats, barley, wheat, turnips and the tuber saps of potatoes were examined. Buffer index values at pH 4.6-4.8 and pH 6.4-6.6 were respectively: oats, 0.0423 and 0.0108; potatoes, 0.0199 and 0.0070; barley, 0.0144 and 0.0042; wheat, 0.0065 and 0.0026; turnips, 0.0037 and 0.0025. Oats and potatoes are considered to be amphitolerant, barley alka-tolerant and wheat and turnips mesophilous. Correlations are considered sufficiently good to encourage further investigations and suggest that ecological preferences and tolerances for certain soil-pH ranges are capable of a specific chemical explanation. It might also be possible to control the liming of soils more economically by consideration of buffer-index curves for the soil and roots of proposed crops.

631.416 COMPOSITION OF SOILS

(*See also* Abs. Nos. 1221, 1222, 1300, 1310, 1358, 1439, 1520, 1530)

[1183] 631.416 : 549
HELLMERS, J. H. Beziehungen zwischen der Mineralzusammensetzung einiger Böden und den Untersuchungsergebnissen ihres Düngungsbedürfnisses. **[Relations between mineral composition of soils and the results of investigations of their fertilizer requirements.]** *Z. PlfErnähr. Düng.* 41, 1948 (76-84). [G.] [Geol. Landesanstalt, Berlin]

Use was made of soil of well known properties and constants from Dahlem in an attempt to correlate mineralogical data (particle size, etc.) with chemical analyses for determining fertilizer requirements, and to explain discrepancies in previous results. In order that mineralogical methods may be used more successfully, more attention should be paid to particle-size determinations. The degree of weathering of the coarser minerals should be taken into account and expressed if possible numerically. The examination of the clay fraction should be most detailed.—K.S.

[1184] 631.416 : 631.5
CROEGAERT, J.; LIVENS, J. Variabilité et correlations de quelques constantes chimiques dans les sols de Yangambi. **[Variability and correlations of certain chemical constants in Yangambi soils.]** *C.R. Sem. Agric. Yangambi* 2, 1947 (655-663). [F.]

A study to determine the variability of a soil in a given plot and the changes in soil composition resulting from cultivation. Samples were taken in a forest plot, a fallow and an old palm grove. The forest soil was an average of the sandy-clay soils of the region. The native variability of the soils was high, particularly for certain things such as P which varied in the forest from 1.2-7.7 mg.

After a soil had been put into cultivation both the pH and the exchangeable bases increased. In the forest the pH was of the order of 3.7 whereas in an old palm grove it increased to 4.6. Exchangeable bases increased from 0.7 m.e. to 1.0 m.e. The fallows had a relatively high exchangeable-base content of 2.5 m.e., due to the ashes accumulated during burning. P decreased from 3 mg. to 0.9 mg. per 100 g. of soil and C from 1.1% to 0.6% in a palm grove as compared with the higher values in a forest soil. Soluble sesquioxides showed little change.

[1185] 631.416 : 634.989.82
MAŘAN, B. Význam klestu pro obohacení půdy živinamí. **[The importance of brushwood for improving the nutrient status of the soil.]** *Lesnická Práce* 27, 1948 (150-162). For. Abs. 10 (292). [Cz.r.] [Stát. Výzkummé Ústavy Lesnické, Praha]

Tabulated data of ash constituents of various trees are used as evidence of the importance of leaving brushwood in the forest to maintain favourable soil conditions.

[1186] 631.416.1
GASPART, E. Contribution à l'étude du mouvement des nitrates dans le sol. **[Contribution to the study of the movement of nitrates in the soil.]** *Ann. Gembloux* 55, 1949 (1-27). [F.] [Chilean Nitrates, Antwerp]

A review of work carried out before 1947 under the headings: N losses in uncultivated and cultivated lysimeters, in drained and

undrained cultivated soils and losses into the ground water ; the N balance in nature ; mechanisms limiting nitric-N losses in the soil.

[1187] 631.416.2 : 631.417
GARMAN, W. L. **Organic phosphorus in Oklahoma soils.** *Proc. Okla. Acad. Sci.* 28, 1948 (89-100). C.A. 43 (2721).

The ratio of organic P to N varied from 1 : 6 to 1 : 28, being greater in cultivated soils, and the ratio of organic P to organic matter varied from 1 : 102 to 1 : 642. The data established that organic P is utilized by plants at about the same rate as inorganic P. Acid soils usually contained a higher proportion of organic P than the neutral or calcareous soils.

[1188] 631.416.2 : 631.821.1
BOHNE, H. Laboratoriumsversuche zur Frage der Mobilisierung der Bodenphosphorsäure durch Kalk auf sauren Böden. (1. Mitteilung). **[Laboratory studies of the mobilization of soil phosphorus by lime on acid soils. (1st report.)]** *Z. PflErnähr. Düng.* 43, 1949 (37-55). [G.]

A review of the literature indicates a fairly general agreement that plant-unavailable compounds of P with Al and Fe sesquioxides are converted by liming into root-soluble compounds of Ca and P, and that liming, besides increasing the above-ground yield, increases root activity and growth and the speed of decay of organic matter, thus resulting in increases of available P.

The author's results in pot experiments with rye seedlings in a strongly-acid humous sandy soil kept at 60% of water capacity and receiving $CaCO_3$ at various rates but no N and K indicate, however, that increases in $CaCO_3$ (1) increased the above-ground yield, (2) clearly decreased the quantity of roots produced and (3) caused no increase in P uptake in spite of a pH change from 4.1 to 6.5. Mixing and covering the soil with sand as in the Neubauer technique made possible a higher yield, an increased root growth and a better P nutrition which however could not be referred to the $CaCO_3$ added. Using Riehm's modification of Egnér's lactate method, no increase in solubility of the soil P was caused by increasing the $CaCO_3$ application.

[1189] 631.416.2 : 631.83
OPITZ, K. Versuche über die Wirkung der Kalidüngung auf die Löslichkeit der Phosphorsäure im Boden und in der Düngung. **[Studies of the effect of potassium fertilizing on the solubility of phosphoric acid in soil and fertilizer.]** *Z. PflErnähr. Düng.* 43, 1949 (110-122). [G.] [Univ. Berlin]

Eriksson's conclusion (see *Soils and Fert.* III, p. 106) that K fertilizing of acid soils high in sesquioxides causes fixation of soil and fertilizer P was clearly contradicted by the results of 2 years' pot and Neubauer experiments. Experiments with an acid sandy soil also showed no P fixation due to K fertilizing.

[1190] 631.416.316 : 631.453
PRINCE, A. L.; BEAR, F. E.; BRENNAN, E. G., ET AL. **Fluorine : its toxicity to plants and its control in soils.** *Soil Sci.* 67, 1949 (269-277). [N.J. Agric. Expt. Sta.]

The point at which F became toxic to buckwheat and tomatoes varied with the type of soil, its lime and phosphate levels and the type of plant. Comparable F treatments were much more injurious on sandy loam than on loam. Toxicity was most pronounced at low pH values, such as 4.5, on both soils.

[1191] 631.416.323
BEATH, O. A.; HAGNER, A. F.; GILBERT, C. S. **Some rocks and soils of high selenium content.** *Geol. Surv. Wyoming Bull.* 36, 1946, pp. 23. C.A. 43 (2905).

[1192] 631.416.856
LUNDBLAD, K;. SVANBERG, O.; EKMAN, P. **The availability and fixation of copper in Swedish soils.** *Plant and Soil* 1, 1949 (277-302). [Royal Agric. Coll. Uppsala and State Agric. Expt. Inst., Sweden]

See *Soils and Fert.* XII [402].

[1193] 631.416.856 : 631.461.1/3
HURWITZ, C. **Effect of decomposition of added oat straw and alfalfa meal on solubility of soil copper in ammonium acetate.** *Proc. Soil Sci. Soc. Amer. 1947,* 12, 1948 (195-197).

The amount of ammonium-acetate-soluble Cu in soil is increased by the addition of chopped oat straw and ground alfalfa meal ; this is due to the soluble components

in the crop residues. When such a mixture of soil with crop residues is incubated in conditions allowing the growth of bacteria and moulds the solubility of the Cu is decreased. At 29°C. the numbers of bacteria and moulds increase during the first 8 days and then fall to some extent; the amount of soluble Cu begins to decrease at about the 3rd day. At 2°C. there is no decrease in the soluble Cu during 14 days. Addition of the soluble components of the straw and meal to the ammonium acetate restores the solubility of the copper salts. It is concluded that the soluble components of oat straw and alfalfa meal are decomposed by soil micro-organisms. —L.M.C.

[1194] 631.416.862.1 : 631.453 : 633.18
HENRY, R. Le problème des eaux et des terres alunées de l'Ouest Cochinchinois. **[The problem of aluminized waters and soils in West Cochin-China.]** *Agron. Trop.* 3, 1948 (180-189). [F.]

Aluminized soils and waters are defined as those containing a mixture of toxic salts comprising mostly Al and Fe sulphates. The soils may be recognized by their characteristic vegetation consisting mainly of *Eleocharis equisetina* which is reddish-yellow and very short in strongly, and dark-green and waist-high in slightly, aluminized soils. In the latter case rice may be cultivated with a fair chance of success. The pH value of the waters may be below 3.

In West Cochin-China, the sudden appearance of Al in soils apparently free of the element may be explained by the hypothesis that the whole of the subsoil is saturated with alum or that its formation is possible under certain conditions. Evaporation of water from the surface layer during the dry season results in an upward movement of water from the deeper, aluminized layers that deposits alum at the surface. With the onset of the rains the alum at the surface of the higher ground moves towards the lower parts across zones where alum may also have risen to the surface. The water becomes more and more enriched in alum until it reaches the lower lying areas which, if not connected to a canal, function as a container where the alum concentrates year after year, with devastating effects on the surrounding land. Suggested remedies include :— (a) prevention of the appearance of alum by ploughing in the stubble, continuous and careful cultivation, prevention of drying and maintenance of the maximum amount of water for the longest possible time on the rice field; (b) prevention of the circulation of alum by the division of the rice fields into the smallest possible plots (2-3 ha. at most) by means of dikes; (c) prevention of the concentration of alum by joining each plot to a main canal network; (d) washing out of the surface alum by providing an abundant supply of alum-free water which must be carried in by special canals distinct from those used for drainage; (e) neutralization of alum-promoted acidity by irrigating with the Bassac-river water which is neutral; ashes also might be effective.

[1195] 631.416.871 : 631.461
CANADA, DEPARTMENT OF AGRICULTURE. **Soil micro-organisms in relation to manganese deficiency.** *Canada Dept. Agric. Sci. Serv. Rept. 1947-48*, 1948 (33).

Field tests showed that the application of certain fumigants, e.g., cyanogas, resulted in a reduction of 'grey speck' in susceptible varieties of oats, with marked increases in yield. The abundance of Mn oxidizing organisms, as well as denitrifying and cellulose-decomposing bacteria, showed good correlation with the amount of available Mn. Cyanogas and chloropicrin had pronounced residual effects from soil treatments made the previous year, whereas no residual effects were noted from the formaldehyde or carbon-bisulphide treatments. Results to date support the belief that the occurrence of deficiency symptoms is related to the action of micro-organisms which are able to reduce the supply of available Mn in soil.

[1196] 631.416.871.1 : 631.821.1
COIC, Y.; COPPENET, M. Carences en manganèse dans les sols humifères de Bretagne. **[Manganese deficiencies in the humiferous soils of Brittany.]** *C.R.* 228, 1949 (1379-1381). [F.]

In the greater part of Brittany the use of calcareous amendments on acid humiferous soils almost halves the exchangeable-Mn content when the pH values are increased to 6.4-6.6, with resulting Mn deficiencies and consequent lower yields of wheat and oats. These symptoms occur when the total soil exchangeable Mn is less than 1 mg./kg. and the total Mn in young plants is less than 25 mg./kg.

631.417 ORGANIC MATTER

(*See also* Abs. No. 1214)

[1197] 631.417 : 577.17
FILATOV, V. P.; BIBER, V. A. **Biological activity of extracts and distillates from chernozem soils.** *Dokl. Akad. Nauk* 62, 1948 (437-440). C.A. 43 (1889).

Aqueous extracts of soil samples from the Kotov region had a slight activity with respect to yeast fermentation and wound-healing acceleration. Heating the soil with 10% H_2SO_4 for 2 hours at 100° followed by ether extraction gave variable amounts of unidentified organic substances composed essentially of equal amounts of unsaponifiable matter and organic acids, having a low iodine number. Similar materials were obtained by steam distillation. These substances accelerated yeast fermentation and root growth of sprouting peas, and stimulated wound healing.

[1198] 631.417 : 631.445.7
BZIAVA, M. L. **[The composition of humus in subtropical soils.]** *Pochvovedenie* 1949 (140-146). [R.]

The quantitative relationships of different fractions of the organic matter of a southern chernozem, a subtropical podzolized soil and a krasnozem were determined. The following were the fractions: (1) bitumens and waxes, (2) humic acid, (3) fulvic acid (divided into four sub-fractions), (4) organic matter hydrolysed by n. H_2SO_4, (5) the remainder.

In the southern chernozem the amount of humic acid exceeded that of fulvic acid, whereas in the other two soils the amount of fulvic acid was about twice as great as that of humic acid. These two soils, unlike the chernozem, also contained much humus not firmly bound to the mineral fraction. The high proportions of fulvic acid is regarded as an unfavourable characteristic, and it is suggested that a more favourable form of humus could be produced by growing perennial grasses.

[1199] 631.417.2 : 631.811
GERICKE, S. Humusfragen. **[Concerning humus.]** *Z. PflErnähr. Düng.* 43, 1949 (55-67). [G.] [Berlin-Dahlem]

The growth factor "organic matter" has only a small effect on yields, its effect value C being 0.003 as against 0.122 for the contained N. It has no direct effect on plant growth, but operates in improving the soil's water economy. Humus fertilizing has its greatest effect on yields when decomposition is slow, and one aim of humus research should be the preparation, outside the soil of "stable humus" (containing basic silicates, inorganic P, Al_2O_3, Fe_2O_3, etc.). This would be applied every 3 or 4 years for a lasting form of fertility, while green manuring would contribute towards short-term increases of fertility and microbiological health of the soil. German soils in 60 years have on the average received 421 dz./ha. of organic manure, and their humus content has risen by 0.2%—a result which could have been obtained by the addition of 60 dz./ha. of "stable" humus in one year.

631.42 TECHNIQUE AND ANALYSIS

(*See also* Abs. Nos. 1167, 1506)

[1200] 631.421
SUKHATME, P. V. **The problem of plot size in large-scale yield surveys.** *J. Amer. Statist. Assoc.* 42, 1947 (297-310). [Imp. Counc. Agric. Res., New Delhi]

There is a risk of obtaining over-estimates of the average yield with small-size plots. Plots of $\frac{1}{80}$th of an acre appear to be free from bias.

[1201] 631.421
MITSCHERLICH, E. A. Über die Grösse der Teilstücke bei Feldversuchen. **[The sizes of plots in field experiments.]** *Z. PflErnähr. Düng.* 40, 1948 (15-19). [G.]

The experimental error in field experiments depends on the plot size in the following way: $t=T\sqrt{\frac{k}{qm}}$ where k is the total experimental area, t the mean error of the individual observations, T that of the average of all observations, and qm the size of the separate plots.—K.S.

[1202] 631.422/3
SCHUFFELEN, A. C. Over de interpretatie van de resultaten van het grondonderzoek. **[On the interpretation of the results of soil analysis.]** *Meded. LandbHoogesch. Opzoekingssta. Gent* 13, 1948 (169-190). [Fl.f.e.]

The difficulties of determining available nutrients and the interpretation of classical, quantitative and rapid chemical methods are discussed.

[1203] 631.422
TAMES ALARCON, C. Ensayos rapidos semicuantitativos para la caracterización de suelos con fines agricolas. **[Rapid semiquantitative tests for soil characterization for agricultural purposes.]** *Bol. Inst. Investig. Agron. Madrid* No. 19, 1948 (129-204). [Sp. g.f.e.]

The frequent presence of gypsum in Spanish soils necessitates modification of some of the common rapid techniques. Modification of Spurways' techniques, Kühn's and Todt's methods for pH and Graham's for organic matter are described. Anne's method for organic C, Hénin's for moisture content, Boutaric's for wilting point and the author's methods for texture, gypsum and for Na salts in soil and irrigation water are presented. Sampling and preparation for analysis are shortly described, the agricultural significance of the values obtained by the tests is discussed and the numerical results are tabulated for 106 soil samples.

[1204] 631.423
KNICKMANN, E. Beiträge zur Ausschaltung wenig beachteter Fehlerquellen in der Bodenuntersuchung. **[Prevention of lesser sources of error in soil investigations.]** *Z. PflErnähr. Düng.* 41, 1948 (222-223). [G.]

Practical hints for soil analysts. Lesser known sources of error are described in connexion with sampling and preparation of the sample, pH determinations by various methods, and determination of P_2O_5 and K_2O, and means for their early detection and prevention are discussed.—K.S.

[1205] 631.423
RUBIA PACHECO, J. DE LA; LÓPEZ-RUBIO, F. B. **[Soils. Introduction to their analysis.]** *Inform. Quím. Anal. (Madrid)* 2, 1948 (53-56). C.A. 43 (2347).

A discussion of methods of physico-mechanical and chemical determinations of the composition of the soil with a view to its optimum utilization in agriculture.

[1206] 631.423.3 : 631.416.11
KUNSTMANN, F. W. Über die Bestimmung kleiner Ammoniakmengen in kleinen Mengen Pflanzennährlösung mit Hilfe des Pulfrich-Photometers. **[The determination of small quantities of ammonium in small quantities of nutrient solution with the Pulfrich photometer.]** *Z. PflErnähr. Düng.* 43, 1949 (67-69). [G.] [Legumin-Inst., Neudietendorf/Thür]

Nessler's reagent (0.2 c.c. to 5 c.c. of nutrient solution) was used as indicator. Mg is removed by pretreatment of the nutrient solution by the addition of 0.5 c.c. of n. NaOH/10 c.c. of solution and centrifuging: other ions had no effect. The limit of quantitative determinations is about 0.1µ N/c.c. of solution and of qualitative determination about 0.05µ.

[1207] 631.423.3 : 631.416.2
LEDERLE, P. Untersuchungen über die Leistungsfähigkeit der Laktatmethode bei der Bestimmung der leichtlöslichen Nährstoffe Phosphorsäure und Kalium in Böden. **[Studies of the effectiveness of the lactate method in determining easily-soluble phosphorus and potassium in soil.]** *Z. PflErnähr. Düng.* 39, 1947 (202-218). [G.]

Of the inorganic orthophosphates tested, the P of basic slag, tertiary Mg and secondary Ca phosphates was much more strongly dissolved in (1) the lactate than in (2) the seedling test. Al and Fe phosphates were the least soluble in both tests, and Lahn phosphorite and tertiary Ca phosphate were moderately soluble.

The P of Mg pyrophosphate was only slightly dissolved in (1) and (2). K metaphosphate after 28 days in moist soils was more dissolved in (1). The solubility of different organic P compounds after 28 days of decomposition in or without soil varied greatly, and, especially with (2), depended largely on the quantities used. The indications of (1) were as good as or better than those of (2). With minerals and rocks, the K values given with (1) were in part higher than with (2). (1) was not inferior to (2) in bringing non-exchangeable K into solution. On heating the soils for 3

hours to 120 or 500°C. the root-soluble P usually and root-soluble K always decreased, while the lactate solubility of P and K usually increased. Solubility was little affected by grain size in soils passed through a 2-mm. sieve.

[1208] 631.423.3 : 631.416.4
LEDERLE, P. Ersatz der Alkali-Photozelle durch ein Selen-Photoelement beim Kalium- und Phosphorsäuremessgerät nach Schuhknecht-Waibel. **[Replacement of the alkali photocell by a selenium photo-element in the Schuhknecht-Waibel instrument for estimating potassium and phosphoric acid.]** *Z. PflErnähr. Düng.* 42, 1948 (45-47). [G.]

The use of selenium photoelement S.28 of the Lange Co., with a Lange Multiflex galvanometer and Fixvolter dispenses with the need for an anode battery of electric-power attachment, and so rids the apparatus of current fluctuations or failure.—K.S.

[1209] 631.423.3 : 631.416.4
PETER. H.; KREISSIG, G. Die Verwendung des Flammen-photometers nach Schuhknecht-Waibel ohne Hilfstromquelle und der Ersatz von Ammoniumacetat und Ammoniumoxalat bei der Kalibestimmung nach Schachtschabel durch andere Ammoniumsalze. **[The use of the Schuhknecht-Waibel flame photometer without an auxiliary current source and the replacement of ammonium acetate and oxalate in determining potassium by Schachtschabel's method by other ammonium salts.]** *Z. PflErnähr. Düng.* 42, 1948 (41-44).

Various modifications in the equipment and solutions used were successfully made, to overcome current shortages of the usual types.

[1210] 631.423.3 : 631.416.846
HAVE, J. TEN De bepaling van magnesium met *o*-oxychinoline in zoutzure grondextracten en in plantaardig materiaal. **[The determination of magnesium with *o*-oxyquinoline in HCl extracts of soil and in plant material.]** *Chem. Weekbl.* 44, 1948 (721-725). [Du.e.]

The effects of temperature, concentration of hydroxyquinoline and ammonia, and presence of sulphate are examined. The factor 0.486 instead of the theoretical 0.504 was found satisfactory.

[1211] 631.423.3 : 631.811
KURMIES, B. Nährstoffkontrolle durch Bodenuntersuchung als Grundlage zur Düngeberatung. **[Nutrient control through soil investigations as a basis for advice on fertilizing.]** *Z. PflErnähr. Düng.* 38, 1947 (229-239). [G.]

A method so far tried only on a sandy soil is described, in which changes in the N, P and K contents of soil between sowing and harvesting were sufficiently accurately determined to show to what extent the fertilizers given were insufficient or excessive. Such a test need, however, be made only once during a rotation. Reproducibility of the soil sampling is obtained by taking about 40 samples to a depth of 20 cm. from evenly distributed points over a permanent plot of size 2 × 2 or 5 × 5 square m. within the area being tested. K was determined as cobaltinitrite and the other nutrients by Kramer and Tisdall's method.

[1212] 631.423.3 : 631.811
GOY, S. Zur Auswertung der durch Laboratoriumsmethoden erhaltenen Werte für Phosphorsäure und Kali für die landwirtschaftliche Praxis. **[The evaluation for agricultural purposes of soil phosphorus and potassium values obtained by laboratory methods.]** *Z. PflErnähr. Düng.* 43, 1949 (18-27). [G.]

A method is suggested for determining approximately the amount of nutrient needing to be applied to obtain a reasonably high level of yield on a given soil. It is assumed with Mitscherlich that available amounts of 330 kg./ha of P_2O_5 and 500 kg. of K_2O are needed in any soil for the maximum yield. The application required equals the difference between these amounts and those as found in the soil by Egnér's method and interpreted in accordance with Egnér's requirement and yield tables for soils of various textures and reactions. The amount removed by a crop must be taken into account in preparing for the next crop.

[1213] 631.423.3 : 631.811.4

LEDERLE, P. Untersuchungen über die Bestimmung des Kalkbedarfs von Böden nach Schachtschabel und Vorschläge zur Vereinfachung des Verfahrens. **[Investigations of Schachtschabel's method of determining lime requirement of soils, and suggestions for simplifying the procedure.]** *Z. PflErnähr. Düng.* 41, 1948 (6-20). [G.]

Schachtschabel's method which depends on pH determination on a calcium-acetate suspension was compared with the same author's modification of Jensen's standard method and with the methods of Kappen and Goy-Roos. Schachtschabel and Kappen's methods gave values which are in sufficient agreement with the standard method and show the requisite pH value, whereas lime-requirement data by the Goy-Roos method are considerably lower and do not indicate the soil pH values desired.

Procedures are described which allow of the determination of the initial pH, the pH value of the calcium-acetate suspension and the hydrolytic acidity in soils in one operation, thereby greatly simplifying the determination of lime requirement.—K.S.

[1214] 631.423.4 : 631.431

HÉNIN, S.; TURC, L. Essais de fractionnement des matières organiques du sol. **[Fractionation of soil organic matter.]** *C.R. Acad. Agric.* 35, 1949 (41-44). [F.]

Two forms of humus are distinguished, one of which is closely bound to mineral matter while the other form is not. These may be separated by densimetric fractionation as follows : 5 g. of soil are sieved as for mechanical analysis, rubbed 5 minutes with the finger under 20 c.c. of 0.1% $CaCl_2.6H_2O$ as in Schloesing's method, boiled for 5 minutes and evaporated first on the sand bath and then at 105°C. On becoming pasty, 10 c.c. of alcohol are added and the soil is finger-rubbed ; this operation is repeated and the dried soil is fractionated in benzene-bromoform of density 1.5-2.5. Experiments with peat-clay mixtures and with natural soils indicate distinct grades of density. The organic matter which floated at higher densities was finer, more soiled with mineral matter and of a definitely narrower C/N ratio than that floating at lower densities. It is suggested that the existence of such grades may allow a more precise characterization of the different types of humus than the simple determination of the C/N ratio for the whole soil.

[1215] 631.423.5

GEE, J. C. DE Over het onderzoek naar het electrolyt-gehalte van zoutrijke gronden. **[On the investigation of the electrolyte content of saline soils.]** *Landbouw* 20, 1948 (265-268). [Du.] [Alg. Proefst. Landb., Buitenzorg]

An apparatus, involving the use of a high-resistance Wheatstone bridge, for the determination of the electrolyte content of saline soils is described. Preliminary experiments with solutions of NaCl and KCl indicated that an accuracy of less than 3% can be obtained. Na and K must be estimated chemically or photometrically but Cl concentration can be determined by a direct potentiometric method by using a Ag—AgCl electrode.

[1216] 631.423.7

CHOINIÈRE, L. Sur une mise au point d'une nouvelle méthode pour l'extraction des bases échangeables des sols acides et des sols calcaires. **[On the development of a new method for the extraction of exchangeable bases from acid and calcareous soils.]** *Sci. Agric.* 28, 1948 (493-500). [F.e.] [Min. Agric., Quebec]

Comparison of the methods of Williams and of Peng and Chu for the extraction of exchangeable bases shows that the latter has considerable advantages over the former, but that both give low results. In the method proposed, 20 g. of sandy soil, or 10 g. of soil containing less than 60% of sand, were placed on cotton wool in a test tube with a hole at the base, and a filter paper over the opening of the tube. The test tube was inserted in a Soxhlet extraction tube provided with a condenser, above a flat-bottomed flask containing 80 c.c. of 0.5 n. acetic acid that was heated for 16 hours by a hot plate. The solution was then made up to 100 c.c. and the exchangeable-base content determined. Higher results were obtained by this method than by the methods of Williams and Peng and Chu. In the case of calcareous soils the quantity of CO_2 evolved as a result of the decomposition of carbonates by the acetic acid was

absorbed in $Ba(OH)_2$ solution and estimated. From the values obtained the amounts of Ca and Mg originating from carbonates were calculated, and corrections made accordingly in the estimation of exchangeable bases.

[1217] 631.423.7 : 631.416.5

MORANI, V. Il sodio nel terreno agrario.—Nota I. Determinazione rapida del sodio scambiabile nei terreni privi di calcare. **[Sodium in agricultural soils.—I. Rapid determination of exchangeable sodium in non-calcareous soils.]** *Sta. Chim. Agrar. Sper. Roma Ser.* III. Pub. 4, 1948, pp. 7. [I.]

Na is precipitated as the complex magnesium-uranyl acetate and the precipitate is measured as a height of sediment in the (previously calibrated) capillary lower part of a special centrifuge tube of total capacity about 40 ml. To obtain reproducible results a study was made of crystal form of the complex sodium acetate. The essence of the method adopted is: 10 gm. of air-dry soil in a 500-ml. flask are shaken for an hour with 200 ml. of 0.5 n. acetic acid, decanted, and the soil washed on a filter 3-4 times with 50 ml. of the acid; the total liquid is evaporated and gently ashed in a 150-ml. basin; the ash is taken up with boiling water (if much sulphate is present a little $BaCO_3$ should be added at this point and the mixture brought to the boil), filtered and evaporated down to about 10 ml., any turbidity being ignored. The reagent consists of 44.8 g. of uranyl acetate, 140 g. of Mg acetate (or 26.32 g. of MgO and 78 ml. of glacial acetic acid), 28 ml. of glacial acetic acid, water to 700 ml., 200 ml. of ethyl alcohol, 100 ml. of ethyl ether, this being filtered after 48 hours and stored in the dark. Precipitation is effected at 15-25°C. The centrifuge tube has a mark at 35 ml.; the capillary is 35mm. long and 2 mm. internal diameter. The capillary is filled with the reagent, and the 10 ml. of extract solution washed into the centrifuge tube with 3-4 portions of the reagent, which does not give an immediate precipitate. The tube is stoppered for 24 hours and then centrifuged to constant height. Not more than 1.2 mg. of Na should be present per tube.—R.N.

[1218] 631.425.1.005

KOLIASEV, F. E. **[Technique of determining soil "ripeness".]** *Dokl. Akad. S.-Kh. Nauk* No. 7, 1948 (40-42). [R.]

From the physical point of view the criterion of soil ripeness is the moisture status.

As a basis for the field determination of soil ripeness the axiom is accepted that there is a definite condition at which the soil under a load, undergoes a maximum compression, i.e., a maximum loss of the original volume.

A portable field apparatus for the determination of compressibility is described, consisting of a hollow brass cylinder, two screw-in ebonite pistons (one at each end of the cylinder) and two piston rods with two steel springs of known tension situated between the pistons and the piston rods. Soil is packed into the cylinder and is compressed by the two piston rods acting through the springs on the pistons. Pointers fitted to the pistons indicate on a millimetre scale the degree of compression of the soil in the cylinder. The reduction in length of the spring enables the amount of compression on a unit surface of soil to be estimated. This apparatus enables the relation of the decrease of the original volume of the soil to its moisture content to be determined. Air-dried soil was least responsive to compression. At 18% moisture in a chestnut soil a very high degree of compressibility of the soil was obtained, up to $\frac{1}{3}$ of the original volume (33%).

[1219] 631.425.22 : 631.437.31

BOUYOUCOS, G. J. **Nylon electrical resistance unit for continuous measurement of soil moisture in the field.** *Soil Sci.* 67, 1949 (319-330). [Mich. Agric. Expt. Sta.]

The unit is reliable, reasonably accurate and highly sensitive to moisture changes, especially at high levels of water content, and should last 5 years in the soil. Errors arising from the soluble-salt content of soils are not serious if the unit is calibrated for each soil. For determining total water content over a wide range, the unit is superior to the plaster-block method which should be retained at present for determinations of available-water content. For most of the large number of soils so far studied, the saturation point lies at about 150 ohms, the field capacity near 2500 ohms and the wilting percentage 300,000 ohms. See also *Soils and Fert.* XI [1753].

[1220] 631.425.23

SCHIFF, L.; DREIBELBIS, F. R. **Infiltration, soil moisture, and land-use relationships with reference to surface run-off.** *Trans. Amer. Geophys. Un.* 30, 1949 (75-88).

A method is described for determining rates of water movement within the soil profile on catchments under natural conditions. The amounts of water taken up during storms by successive inch increments of soil were determined by gypsum-block and tensiometer methods. The times required for these accumulations were determined from the accumulated infiltration curve or from rainfall minus interception-storage when no run-off occurred. Analyses show the velocity of water moving through the soil under various conditions, particularly differences in available storage space. Transmission rates up to 10 in./hour were obtained for the topsoil. For a number of storms, water reached the subsoil shortly after run-off began. After water reached the subsoil, the rates at which the remaining topsoil storage was exhausted were deducted from the infiltration rates to give the percolation rates as the supply to the subsoil. These did not exceed 0.6 in./hour, and transmission rates did not exceed 1.5 in./hour. Infiltration rates decreased to a constant rate at saturation and the subsoil transmission rates became the controlling factor. Little use is made of subsoil storage space during storms. Transpiration has an important effect on run-off during periods of high-intensity storms.

[1221] 631.427.3 : 631.547.2

GERICKE, S. Untersuchungen über das Ertragsgesetz. I. **[Studies of the yield law. Part I.]** *Z. PflErnähr. Düng.* 38, 1947 (54-65). [G.]

Mitscherlich's yield law is expressed by the equation log (A-y) = log A—c^b, in which y is the actual yield in dz./ha., b is the amount of the nutrient or "growth factor" in question in the soil (here P_2O_5) in dz./ha., c is the "effect value" representing the productive effect of the factor, and A is the theoretical maximum yield, which remains constant for the different levels of fertilizing so long as the level of the other growth factors (here N etc.) remains the same.

From the results of numerous fertilizer experiments, using different levels of the nutrient, it is possible from the equation to calculate (1) a reliable figure for b and (2) the mean increase in yield that will result from an increase in the nutrient factor if the others remain at the same level. The results (all in dz./ha.) from 1218 experiments on rye receiving basal NK+different levels of P_2O_5 were as follows:

P_2O_5 in soil	y	A (calculated)	b (calculated)
b	20.7		1.04
b+0.3	22.8	26.8	
b+0.6	24.0	26.5	
b+0.9	25.7	27.7	
b+1.2	26.1	27.4	
		Mean: 27.1	

The above figure for b and those for the results with 8 other crops reliably reflect the available-P status of the soils. P-fixation effects showed only when < 0.3 dz./ha. of P_2O_5 was applied, and limited the applicability of the yield law, causing the yield curve to deviate all the more strongly from the normal form when the other growth factors were increased.

[1222] 631.427.3 : 631.547.2

GERICKE, S. Untersuchungen über das Ertragsgesetz. II. **[Studies of the yield law. Part II.]** *Z. PflErnähr. Düng.* 38, 1947 (215-229). [G.]

The yield law is discussed in the light of the mean results of several thousands of experiments in which K_2O at 0, 60, 80 and 120 kg./ha. was added to 12 crops over several years. (c for K_2O=0.4). The values calculated for b, the plant-available K_2O, reflect the poverty of meadow soils as against arable (2.2 and 1.56 dz./ha. respectively). Calculated crop yields agreed closely with those found experimentally: the equation may be used to calculate the increase in yield due to a given addition of K_2O. Experiments in which other growth factors varied as well as K_2O (soil type, rainfall) showed that the law was applicable under these conditions also. The values calculated for b with rye under 4 levels of rainfall (1.73, 1.98, 2.05 and 2.11 dz./ha. under rainfall of <50, 55, 65 and >70 cm. respectively) reflect the smaller K_2O-assimilation capacity of this plant under dry conditions.

Values of A for some of the crops in the P_2O_5 and in the K_2O series were, in dz./ha., as follows:

	Rye	Barley	Wheat
P_2O_5	27.1	29.8	31.0
K_2O	26.7	30.5	32.2

	Potatoes	Sugar Beet	Meadow Hay
P_2O_5	281	413	92.5
K_2O	280	410	88.9

A thus characterizes the productivity of the soil at a given level of N supply to the plant.

The general results of both series indicate that the law holds for the mean results of large numbers of experiments both for P_2O_5 and for K_2O, within the limits of the quantities applied.

[1223] 631.427.3 : 631.547.2
GERICKE, S. Untersuchungen über das Ertragsgesetz. III. **[Studies of the yield law. Part III.]** *Z. PflErnähr. Düng.* 39, 1947 (245-258). [G.]

Mitscherlich's yield law holds for the growth factor N, except with cereal crops, in which the value of A, the calculated maximum yield, decreased with increasing N applications. Physiological disturbances within the plant acting as "negative growth factors" appear to lower the value of the effect factor c for nitrogen, its normal value of 0.122 holding best for applications of 40-50 kg./ha. The available-N content of soils under cereals was about 50% of that of soils under crops receiving farmyard manure and the N added as manure may be calculated through the yield law. On the basis of the calculated mean values of A and b, the yields to be expected from any given N application may be reliably calculated except for barley which shows small anomalies at high N levels.

[1224] 631.427.3 : 631.547.2
MITSCHERLICH, E. A. An der Grenze der Ertragsteigerung. **[To the limit of yield increase.]** *Z. PflErnähr. Düng.* 40, 1948 (193-200). [G.] [Berlin]

In the application of the author's growth-factor efficiency law to the results of 27,000 field experiments, there was a discrepancy at the maximum-N dressing of 0-6 dz./ha., when yields, particularly of cereals, were below the calculated values. The discrepancy was attributed to crop damage, presumably by lodging. The crop yields were accordingly treated by the second approximation of the law, $y=A(1\text{-}10^{-cx}).10^{-kx^2}$, where A is the highest attainable yield, y the actual yield and x the value of the growth factor concerned; c is the known efficiency value of the individual plant nutrients, and k is the injury constant. It was found that wheat, which has been bred for rigidity for many years, suffers the least depression in yield increase from high N dressing (k=0.032); rye is particularly susceptible (k=0.185); for oats k=0.10. Observations on spring barley show that the straw yield (k=0.073) is much less affected by lodging than the grain yield (k=0.48). This may be true of all cereals, but data are lacking.

The danger of lodging with high dressings of water-soluble nitrogenous fertilizers is so great that maximum theoretical yields cannot be attained. Yields of wheat increase only to half, of oats only to one-third, and of rye only to one-quarter of the maximum yields, and then decline rapidly with further increase in N application.

There is no danger to maximum yields from high dressings of P_2O_5 or of K_2O; these yields require in the soil: 3.3 dz./ha. of pure P_2O_5 and 5 dz./ha. of pure potash.—K.S.

[1225] 631.427.3 : 631.547.2
MITSCHERLICH, E. A. Was leistet der Stickstoff im Futter- und Kohlrübenbau? **[The efficiency of nitrogen in mangold and turnip growing.]** *Z. PflErnähr. Düng.* **41, 1948** (1-6). [G.]

The author verifies his N-efficiency expression, log (A-y)=log A-0.122 (x+b) by substituting values obtained in some 3,000 experiments carried out on different soils over many years. For a maximum yield (A) of 1500 dz./ha. of mangolds, and an initial soil-nitrogen content (b) of 2.18%, the

calculated and observed values of y, (crop increase) for a given nitrogen dressing (x) agree very closely.

Yield increases obtained for the two crops in all the trials averaged 126 dz./ha. for the first 0.6 dz./ha. of N ; a further 38 dz./ha. for the second 0.2 dz./ha. of N and 35 dz./ha. for the third 0.2 dz./ha. of N.

An analysis of yield increases obtained in good and bad seasons gave 198 dz./ha. of crop in good years and 193 dz./ha. in bad years, compared with the average of 199 dz./ha. for all seasons.—K.S.

[1226] 631.427.3 : 631.547.2
ROUSSOPOULOS, N. C. Déduction de la formule de Mitscherlich, de première approximation, au moyen de l'algèbre élémentaire. [**Deduction of the Mitscherlich formula, in its first approximation, by means of elementary algebra.**] *Ann. Agron.* 18, 1948 (708-713). [F.]

[1227] 631.427.4
GERRETSEN, F. C. **On the use of *Aspergillus niger* for the determination of plant nutrients in the soil.** *Anal. Chim. Acta* 2, 1948 (782-792). [E.] [Agric. Expt. Sta. and Inst. Soil Res. T.N.O. Groningen]

An improved Niklas's culture solution was devised which was sufficiently buffered to keep the pH changes between permissible limits and which was not influenced by the humus content of the soil, nor by the presence of Ca or Na salts. With this solution and a newly-isolated strain of *A. niger* the determinations had an accuracy equal to that of chemical methods and took only a quarter of the time. Mg and Zn were determined by this method.

[1228] 631.427.4 : 631.416.8
MULDER, E. G. **The microbiological estimation of copper, magnesium and molybdenum in soil and plant material.** *Anal. Chim. Acta* 2, 1948 (793-800). [E.] [Groningen]

Details of the determination of these elements by the *Aspergillus niger* method. From the results obtained and also some not recorded in this paper it was concluded that soils producing normal cereals contain 2 γ or more of available Cu/g. of soil. From 0.6 to 1.5 γ, light symptoms of Cu deficiency occur and with less than 0.6 γ serious symptoms of this deficiency may be expected in wheat and oats. For Mg the corresponding figures are 100 γ, 50-100 γ and 50 γ or less per g. of soil. No symptoms of Mo deficiency were found in Dutch soils.

631.43 SOIL PHYSICS

(*See also* Abs. Nos. 1165, 1167, 1219, 1513)

[1229] 631.43
HOOGHOUDT, S. B. De onderlinge binding van minerale gronddeeltjes in verband met de structuur van de grond. [**The mutual binding of mineral particles in relation to soil structure.**] *Landbouwk. Tijdschr.* 60, 1948 (338-349). [Du.e.] [Landbouwproefst. Bodemk. Inst. T.N.O. Groningen]

The behaviour of models made from dried soil pastes was studied by determining the physical quantities :—Brinell hardness number ; the moduli of rupture by pressure, bend, smash and tear ; the pore space of wet and dry models ; shrinkage, and the Atterberg flow limit. The materials used were humus- and $CaCO_3$- free clays mixed with subfractions of the 16-2000μ fraction. The temperature of drying had practically no effect, suggesting that the binding force of dried pastes is not due to surface tension. All the physical quantities increased with increasing clay content and with fineness of the sand component. In mixtures with 20% clay but with a specific surface increasing from 50 to 310 the modulus of rupture by pressure increased rapidly at first and later more slowly. The physical quantities were higher in the case of Ca-saturated than H-saturated mixtures, and diminished in the order Li-, Na-, K-, Rb- and Cs- saturation, indicating that the dominating influences are those of cation size and hydration. The effect of the triethanolammonium ion was of the same order as that of Ca. Artificial humus slightly diminished the physical quantities and binding force.

[1230] 631.431 : 631.432.2
POP, L. Influenţa apei asupra greutăţii volumetrice a solului. [**The influence of moisture on the volume weight of soil.**] *An. Fac. Agron. Cluj 1946-1947*, 12, 1949 (211-220). [Rm.g.]

In contact with water soil expands and its volume weight decreases. Volume expansion is greatest in soils rich in organic and inorganic colloids. Quartz sand did not increase in volume.

[1231] 631.432 : 551.49
WILM, H. G. **How long should experimental watersheds be calibrated?** *Trans. Amer. Geophys. Un.* 30, 1949 (272-278). [Southern For. Expt. Sta., New Orleans, La.]

A statistical method is presented applying especially to studies in which 2 or more catchments are controlled by stream-gauging and other equipment, are calibrated for a suitable period and then all but one are subjected to treatment such as a change in land use. Equations are derived for estimating the number of observations required, before and after treatment, to demonstrate that a treatment effect of any chosen order of magnitude is larger than might have been expected by chance.

[1232] 631.432 : 631.557
HOOGHOUDT, S. B. Derde mededeling omtrent het grondwaterstandsproefveld op de proefboerderij "Jacob Sijpkens Heerd" te Nieuw-Beerta. [**Third communication on the groundwater-level trials at the "Jacob Sijpkens Heerd" experimental farm at Nieuw-Beerta.**] *Maandbl. Landb-VoorlD.* 5, 1948 (467-472). [Du.] [Landbouwproefst. Bodemk. Inst. T.N.O. Groningen]

The ground-water level was constantly maintained at depths of 40, 60, 90, 120 and 150 cm.—plots 40, 60, 90, 120 and 150 respectively—and three crops sown on each plot. The first season, the ground-water level did not affect field beans and caraway, but the growth and yield of peas increased with increasing depth. The following season additional N was applied to half of each plot. The yields of spring barley from plot 40 receiving N at 100 and 50 kg./ha. were lower than those from the normally, but not excessively, manured plots 120 and 150. Owing to the dryness of the season, plot 40 gave the lowest yields of caraway seeds, but these were increased by the additional N. On plots 120 and 150, however, additional N depressed yields. The yields of spring wheat increased with increasing depth of groundwater. The heavier application of N did not raise the yields of plot 40 to those of plots 120 and 150 which had received no additional N.

[1233] 631.432 : 634.97
SILKER, T. H. **Planting of water-tolerant trees along margins of fluctuating-level reservoirs.** *Iowa St. Coll. J. Sci.* 22, 1948 (431-447). B.A.BIII, 1949 (65).

Data on survival, height and adaptation to changing water tables and to soil and ground-cover conditions of various trees are given.

[1234] 631.432.2
KOLIASEV, F. E.; MEL'NIKOVA, M. K. [**A contribution to the theory of the differential moisture of the soil. (Mobility of water in the soil at different moistures.)**] *Pochvovedenie* 1949 (147-156). [R.]

According to a theory advanced by the authors the speed of drying of a moist soil is related to the mobility of water in the soil. Curves showing speed of drying against moisture content were constructed for a deep chernozem, a podzolized soil, a serozem and a sandy loam. These had the usual form for colloidal materials and were characterized by a period of constant speed of drying at high moisture content, and 2-3 periods of falling speed, with 2-3 corresponding "critical points" at which the direction of the curve changed. It was found that the critical points correspond to recognized moisture states, i.e., the first critical point corresponds to the cessation of capillary flow of water to the surface, or to the "moisture of meniscus formation" (rather more than the maximum molecular moisture capacity), and two other critical points to the wilting point and the maximum hygroscopicity.

The second critical point corresponds to the cessation of surface tension and in the chernozem occurred at 17-19% moisture content. In the range between the second and third critical points, further movement of moisture occurs, presumably in the form of a film, and osmotic and thermo-osmotic forces are concerned in the movement which is considerably slower than before. At this stage water moves to some extent in the form of vapour. The third critical point occurred in the chernozem at 10-11% moisture content (maximum hygroscopicity =10.26%). Presumably as the film becomes thinner the rapidity of drying decreases, and finally film movement of moisture is

practically ended and moisture movement by diffusion in the form of vapour sets in.

The speed-of-drying curves for the other soils were analogous to that for the chernozem. The critical points occurred at different moisture contents, but they had the same significance.

[1235] 631.432.2 : 631.347.24 : 551.577
BAUMANN, H. Zur Kenntnis des Wasserhaushalts eines lehmigen Sandbodens bei künstlicher und natürlicher Beregnung. 2. **[The water economy of a loamy sand soil under artificial and natural rain. 2.]** *Z. PflErnähr. Düng.* 43, 1949 (28-36). [G.]

In 1947, which was dry, the results of soil-moisture determinations under potatoes and summer wheat confirmed the results of 1946 (see *Soils and Fert.* XI [809]) concerning the different degrees of penetration into the soil of natural and artificial rain and the marked variability of water consumption of crops. Summer wheat exhausted the soil-moisture content almost to the hygroscopic level in the upper soil layers, 2% being the lowest value reached, and to about 6 times the hygroscopic level in the subsoil. The lowest moisture content induced by potatoes in the upper soil was 4%. The strong relationship between the limit of impoverishment reached and the mass and penetration of the root did not permit the establishment of a relationship between this limit and the hygroscopicity.

[1236] 631.432.2 : 631.436.6
DREIBELBIS, F. R. **Some influences of frost penetration on the hydrology of small watersheds.** *Trans. Amer. Geophys. Un.* 30, 1949 (279-282). [U.S., S.C.S., Coshocton, Ohio]

Frost penetration retards percolation, retains water in the profile that normally would drain, and through its influence on percolation and resultant available storage may affect infiltration for a considerable time after the frost period. Records are discussed of frost penetration and hydrological data for the Muskingum-silt-loam catchment 109 at Coshocton. In spite of low precipitation in February and March when deep frost prevailed, the profile was almost saturated. In April, May and June, with precipitation above normal, the soil-moisture content remained so high that oats and maize sowings were much delayed. In grassland and woodland the more porous frost structure (honeycomb and stalactite) is common, while cultivated land favours the production of the deep and more impermeable concrete type.

[1237] 631.432.2 : 634.9
KHARITONOV, G. A. **[Precipitations in forest and field and their entry into the soil.]** *Pochvovedenie* 1949 (95-109). [R.]

Measurements were made to determine the fate of all precipitations in a forest and in a comparable open area. The proportion of the total rainfall on a closed, 117-year-old oak forest that ran down the tree trunks to the ground was negligible—about 0.04%. The amount penetrating the canopy was 87% of the total rainfall in a neighbouring open field, indicating that 13% was held back by the forest canopy. The amount of snow measured in the forest was 24% greater than in the field; the difference is explained mainly by the greater evaporation in the field, but also by losses due to temporary thaws during the winter that occurred in the open, but not in the forest. The snow cover in the forest was looser and thicker than in the open and protected the soil better from freezing. In the forest, also, the thickness of the snow cover was more regular, due largely to lack of subsequent disturbance by wind.

Thawing of snow took place about 10 days later in the forest than in the field, was more gradual and less liable to result in soil erosion. (These results were obtained in the southern part of the forest-steppe region.) The "coefficient of run-off" during the spring thaw averaged 0.87 and occasionally reached 1.0 in the open, as against 0.014 under forest. The different and complex temperature relationships of the soil in the open and under forest during the thaw favour infiltration and absorption of melted snow under forest. Provisional figures for evaporation showed that in the period April-November twice as much water evaporated under forest as in the open, but it is admitted that the practical significance of these figures is not clear.

[1238] 631.432.2 : 634.953.6
BURNATSKY, D. P.; SUCHALKINA, M. I. **[The moisture regime of soils of the Stony Steppe in dry years.]** *Agrobiologia* No. 1, 1949 (148-159). [R.]

Comparisons were made in two drought years (1946 and 1947) of the moisture contents of soils at depths from the surface down to one metre and under (1) a grass-arable rotation and protected by shelter belts, (2) a grass-arable rotation without shelter belts, and (3) a grain-fallow rotation without shelter belts. Crops protected by shelter belts suffered no damage from drought, and the moisture content of the soils was consistently higher than without such protection. The moisture content of soils under (2) was higher than under (3). Also, the degree of effective utilization of winter precipitation (snow) was in the order (1), (2), (3).

[1239] 631.432.21 : 581.5
SCHOFIELD, R. K.; PENMAN, H. L. **The principles governing transpiration by vegetation.** *Inst. Civ. Engrs. Proc. Conf. Biol. Civ. Engng. 1948*, 1949 (75-84).

The amount of drainage from soil over a period is the amount of precipitation that is not transpired by growing vegetation or lost by evaporation from bare soil. The main source of the necessary latent heat of vaporization is sun and sky light and hence the total evaporation from a given area of vegetation is dependent upon the acreage rather than upon the integrated leaf area.

For evaporation from open water it is possible to relate the evaporation rate to external weather conditions, and direct comparison of equal areas of open water and plentifully-watered grass shows that the latter too is controlled by the same external conditions. Because of leaf structure and seasonal changes in day-length, the transpiration rate from grass is less than the evaporation rate from open water by about 20% in summer, 40% in winter, and 30% in equinoctial months.

During the growing season the moisture deficit in the soil will increase at a rate dependent upon the drying power (determined by weather) and the seasonal factor until the root range of the crop becomes a limiting factor. After the deficit reaches a value of C inches, depending upon soil type and depth of rooting, further increase takes place at progressively lower rates. Examination of available data indicates that C has a small range of about 3 inches for grassland in Britain and, in particular, the calculated values of evaporation from the grassland of the Cambridge University Farm, based on values of C of this order, are checked by direct observation of the soil moisture and by the recorded dates on which the field drains started to run.

Minor factors may cause local disturbances; such are cracks in dry soil, rising soil temperature which may produce slight drainage, and poor natural structure which may delay drainage. The last will often occur in sandy and similar soils without coarse drainage channels produced by swelling and shrinking, drainage being very slow and almost continuous. Although precise specification of times of zero moisture deficit is not possible on such soils, an arbitrary specification, that will meet ordinary practical requirements, will often be possible.

[1240] 631.432.3 : 631.821.2
RAMDAS, L. A. **Effect of salts on soil permeability and rectification of alkali-ridden soils.** *J. Sci. Indust. Res. (India)* 8b 1949 (21-22).

The effect of NaCl in improving the permeability of alkali soils was only temporary. On leaching out the NaCl with water the Na_2CO_3 which is retained in the soil particles reasserts itself, rendering the soil impervious once more. An alkali soil treated with either $CaCl_2$, $BaCl_2$ or $SrCl_2$ instead of NaCl, however, remains permanently permeable. A soil thus leached out can support vegetation like a normal soil, that is one free from Na_2CO_3.

[1241] 631.433.1.005
JAMISON, V. C.; REED, I. F. **Durable asbestos tension tables.** *Soil Sci.* 67, 1949 (311-318). [U.S.D.A., Auburn, Ala.]

A modification of the soil-moisture tension table of Leamer and Shaw for the determination of macroporosity is described. Water-stable asbestos board is used as a membrane, which is clamped over a copper screen in a tray constructed from angle and sheet brass. A method of arranging table units in cabinet form is described. The operation of the device is explained and results are given for

a test with soils including a sand, a loam and 2 clays. A 1-day equilibration time is more than adequate for taking most soils from saturation to any tension up to 120 cm. of water.—From authors' summary.

[1242] 631.434

CLEVERINGA, O. J. Waarnemingen over de invloed van de behandeling van de grond op de structuur van cultuurgronden. [**The effect of cultivation on the structure of arable soils.**] *Landbouwk. Tijdschr.* 60, 1948 (358-368). [Du.]

The study of structure is considered under the following heads :—(a) Görbing's method of profile examination (compaction, plasticity, aggregate size and distribution measurements, etc.) ; (b) the close relationship between good structure (tilth) and healthy crops : (c) the properties of an ideal soil (stable-aggregate size 1-3 mm., pore volume 55-60%, capillary to non-capillary pore ratio 45 : 55, good aeration, lack of clods, etc.) ; (d) classification of structures encountered in practice—4 groups are distinguished (1) crumb structure, (2) clod structure including cloddy-crumb and crumby-clod, (3) bank structure, (4) natural or material structure ; (e) freedom from diseases and weed infestation correlated with increasing fineness of aggregate.

The soils of Holland have deteriorated seriously over large areas ; good structure is present only on alluvial land, on manured cattle pastures and on old permanent grass. Arable soil structure is good only on reclaimed polders. The scarcity of organic matter makes the position difficult to remedy unless organic waste materials now lost to the land can be recovered and utilized.—K.S.

[1243] 631.434

HUIZINGA, T. K. De structuur van de grond. [**Soil structure.**] *Landbouwk. Tijdschr.* 60, 1948 (317-321). [Du.]

A review of current ideas under the following heads : definition of structure, measurement of soil structure, cause of structure, soil formation, development of structure, modification of the original structure.—K.S.

[1244] 631.434

SCHUYLENBORGH, J. VAN De structuur van de bodem. [**Soil structure.**] *Landbouwk. Tijdschr.* 61, 1949 (96-111). [Du.e.]

A condensed treatment of the subject of the author's thesis (see *Soils and Fert.* XI [478]).

[1245] 631.434 : 631.416

RUBASHOV, A. B. [**The genesis of water-stable structure and its role in soil fertility.**] *Pochvovedenie* 1949 (129-139). [R.]

Water-stable aggregates contained slightly more humus, and especially more "loosely bound" humus which is the main structure-forming agent, than the unaggregated soil. The contents of "mobile" N, P and K were considerably higher in the aggregates than in the unaggregated soil.

[1246] 631.434 : 631.416.7

KURON, H. ; HANNEMANN, W. Der Einfluss des Kalks auf die mechanischen Eigenschaften der Bodenkolloide. [**The effect of lime on the mechanical properties of soil colloids.**] *Z. PflErnähr. Düng.* 40, 1948 (200-206). [G.]

[This summary of results is based on curves which escaped destruction when the main data were lost by war damage.]

Soils of varying known adsorption capacity, particle-size distribution, pH, colloid content, etc., were tested for shock stability by Jacob's shock pendulum. The soils were saturated with CaO to different degrees, weighed into glass cylinders of 16 mm. diameter and 30 mm. in height, and dried to a standard moisture content.

The curves show that shock stability of soils varies widely. There is general parallelism with adsorption capacity, i.e. with colloid content. Shock stability was low in soils rich in humus, indicating a loosening effect of the organic matter. Generally, stability is maximum in the lime-saturation range 75-100% and decreases with excess $Ca(OH)_2$. This is in line with the known favourable effect of free calcium compounds on physical properties. The steepness and course of the rise in stability with increasing lime saturation differs greatly in different soils. Both appear to be closely related to particle-size composition of the soil and the possibility of interlocking and bridge-building between

particles. The curve for a compact loam shows a marked peak as compared with the rather flat curve for a black earth.

Phyllite soils are exceptional in that stability increases with $Ca(OH)_2$ applications beyond 100% saturation.

Soils are affected very differently by excess $CaCO_3$. Generally stability declines, but the effect is less than with $Ca(OH)_2$. There may be a subsequent increase in stability which may be due to the accumulation of very fine carbonate particles in the pore interstices of the soil particles and which promotes bridge building between particles.—K.S.

[1247] 631.434 : 631.417
HUDIG, J. De betekenis van organische stof voor de structuur van de grond. **[The importance of organic matter for soil structure.]** *Landbouwk. Tijdschr.* 60, 1948 (349-357). [Du.]

The author reviews the classic theories associated with the names of Thaer, Liebig and Wollny and the later work of the more eminent authorities on humus of the American, Dutch and German schools. He discusses his own view of humus as a stable product incapable of attack by microorganisms, and claims that Kubiena and Redlich's microscope-slide technique actually shows the existence of a film of stable humus clothing the individual soil aggregates.

He classifies soils into four classes: (a) The ideal soil with pore volume 55-66% and possessing no 'clod'. Colloidal silica is very low, and organic matter pervades the soil. (b) Soil beginning to show clod development ("continent structure" in Redlich's slides), and pore volume below 50%; SiO_2 is rather greater than in (a) and more organic matter is required. (c) Soils with extensive clod formation, pore volume below 30% and entirely continent structure, little organic matter present. (d) Soil with fine particles subject to wind and water erosion, pore volume 25%, organic matter very deficient.

Organic matter is an essential material for producing and maintaining crumb structure in soil. The process is a dynamic one; organic matter in an aerated soil is destroyed, and replenishment is necessary to keep the soil productive. Nature has provided stable products which maintain structure, but this condition may be disturbed by intensive cultivation or by monoculture.—K.S.

[1248] 631.434 : 631.432.2
VERSHININ, P. V. **[Certain natural laws of importance in soil cultivation.]** *Dokl. Akad. S.-Kh. Nauk* No. 4, 1948 (10-16). [R.]

The two principal factors affecting the tendency of a soil to compaction are pressure and soil moisture. These two factors were investigated on chernozem soils by the so-called "constant-volume" method which, however, is not adequately described. Optimal soil structure is attained at that degree of soil moisture which enables the soil to attain its maximum density. This corresponds to Vilensky's "moisture of structure formation."

[1249] 631.434 : 631.445.7
HOORE, J. D'; FRIPIAT, J. Recherches sur les variations de structure du sol à Yangambi (Congo Belge). **[Researches on the structural variations of Yangambi (Belgian Congo) soils.]** *Pub. I.N.É.A.C. Sér. Sci.* 38, 1948, pp. 59.

A more detailed report of the material published in *Soil Sci.* 66 (91-104). (*Soils and Fertilizers* XI, [1771].)

[1250] 631.434 : 633.2.03
MCHENRY, J. R.; NEWELL, L. C. **Residual effect of some perennial grasses on the structure of an Eastern Nebraska fine-textured soil.** *Agron. J.* 41, 1949 (76-78). [Agric. Expt. Sta., Lincoln, Nebr., and U.S.D.A.]

2 years after various grass sods had been broken up and crops planted, the percentage of water-stable aggregates greater than 0.25 mm. had decreased by more than 50% for all grass sods except buffalo-grass sod (*Buchloe dactyloides*), which was markedly more stable. A weedy check plot gave a greater reduction in aggregation than any of the grass sods.

[1251] 631.436 : 631.547.2
OPITZ, K. Über den Wachstumsfaktor Temperatur. **[Temperature as a growth factor.]** *Z. PflErnähr. Düng.* 40, 1948 (101-113). [G.]

In critical periods temperature differences of 1-2°C. may be decisive in regard to crop growth.

The Dahlem Plant Climate Station uses an electrical instrument placed in the crop at heights up to 1 m. and in the soil down to

1 m. depth. Temperature records are made at a central record office and expressed as four-hour averages (12 hours at night).

This paper gives a number of temperature records plotted against time of day for turf (5 cm. high), for bare soil and for sandy loam soils carrying autumn rye (38 cm.), spring wheat (12 cm.) and Landsberg mixture (50 cm.) exposed to sunlight of varying duration.

Under 13 hours' sunshine and in the period 12-4 p.m., bare soil reached 24.7°C, soil under spring wheat—a poor stand—reached 24.2°. Under turf the maximum was only 20.5°; the soil under autumn rye—a dense stand—reached only 18.7°. Soil at a depth of 5 cm. carrying the thick shading Landsberg mixture was 9.6° lower than the temperature of bare soil.

The deviation of the curves from the mean daily temperature curve of the Meteorological Station, and still more from the 10-year average shows that these latter data are of small use in plant physiological work.—K.S.

[1252] 631.436 : 631.581

OPITZ, K. Über den Einfluss von Brachehaltung und Bodenbedeckung mit Stroh auf den Temperaturgang in 30 cm. Bodentiefe. **[The effect of fallowing and straw cover on soil temperature at 30 cm. depth.]** *Z. PflErnähr. Düng.* 41, 1948 (213-222). [G.] [Berlin]

Temperatures were measured by electric-resistance thermometer and automatic recording, in fallow soil, in the same soil with a 5-cm. straw cover and in turf, to a depth of 30 cm., at 4-hour intervals from May to October, 1938. The highest and most uniform temperatures were shown by the fallow with a peak at about 24°C. in August; similar but rather less uniform curves were obtained for the soil with straw cover (peak at about 23° in August). The shading effect of the turf (control) was evident (peak at about 20°). All curves tend to commence at the beginning of October. The development of microclimatic temperatures under fallow and loose straw cover is discussed at some length.—K.S.

[1253] 631.437

STRAITON, A. W.; TOLBERT, C. W. **Measurement of the dielectric properties of soils and water at 3.2 cm. wave length.** *J. Franklin Inst.* 246, 1948 (13-20). [Univ. Texas]

The dielectric constant and conductivity of certain soils and water were measured at a wave length of 3.2 cm., using phase-difference equipment. The dielectric constant and conductivity were 3.2 and 0.10 mhos/m. respectively for dry Arizona desert sand, 8.1 and 1.1 mhos/m. for 16 parts sand with 1 part water, and 19 and 2.5 mhos/m. for four parts sand and 1 part water. The dielectric constant decreased and conductivity increased with decreasing particle size. Values for dry, black sandy loam were 2.8 and 0.0074 mhos/m.

631.44 SOIL TYPES

(*See also* Abs. Nos. 1518, 1588, 1590)

[1254] 631.44

BARNES, C. P. **Interpretive soil classification: relation to purpose.** *Soil Sci.* 67, 1949 (127-129).

An introduction to four other papers on interpretive soil classification—"the process of grouping soils into classes made to show predictions of their behaviour or capabilities."

[1255] 631.44

BARNES, C. P.; HARPER, W. G. **Interpretive soil classification: agricultural use and management.** *Soil Sci.* 67, 1949 (141-149).

Soil classifications according to suitable major uses, suitable crops, soil rating, predicted yield, and suitable management practices are illustrated by reference to soil-survey reports in the U.S.

[1256] 631.44

CLINE, M. G. **Basic principles of soil classification.** *Soil Sci.* 67, 1949 (81-91). [Cornell]

Three different types of class characteristics are (1) differentiating characteristics which are those chosen as a basis for grouping, (2) accessory characteristics which are defined as covarying properties associated

with each differentiating characteristic, and (3) accidental characteristics—i.e. properties that vary independently of the basis of grouping. Multiple-category systems, where a category is a series of classes, are necessary where a single grouping fails to show the relationship desired, and natural and technical systems are also defined. Eight principles of differentiation as they affect classes and relationship among categories are detailed. Other definitions apply to sources of criteria and criteria of classification.

[1257] 631.44
GARDNER, R. A.; RETZER, J. L. **Interpretive soil classification, timber, range, and watersheds.** *Soil Sci.* 67, 1949 (151-157).

[1258] 631.44
KELLOGG, C. E. **Introduction.** *Soil Sci.* 67, 1949 (77-80).

An introduction to a symposium on soil classification, in which the current theory on which the American system of soil classification is based, is presented. Only principles are dealt with.

[1259] 631.44
MUCKENHIRN, R. J.; WHITESIDE, E. P.; TEMPLIN, E. H., ET AL. **Soil classification and the genetic factors of soil formation.** *Soil Sci.* 67, 1949 (93-105).

The factors considered in relation to soil classification are time, parent-material, relief, the living-organism and the climatic factor.

[1260] 631.44
RIECKEN, F. F.; SMITH, G. D. **Lower categories of soil classification: family, series, type, and phase.** *Soil Sci.* 67, 1949 (107-115).

The concepts of soil series, type, phase and the family category are defined and discussed in some detail.

[1261] 631.44
THORP, J.; SMITH, G. D. **Higher categories of soil classification: order, suborder, and great soil groups.** *Soil Sci.* 67, 1949 (117-126).

Recent changes in the classification adopted by the Division of Soil Survey are as follows:

(1) The distinction between pedalfers and pedocals in the zonal order no longer appears.

(2) New great soil groups known as Gray Wooded or Gray Podzolic soils, Low-Humic Glei soils and Regosols have been established.

(3) Dry Sands, Yellowish-brown Lateritic and Yellow Podzolic soils have been included with other great soil groups. In an alphabetical list of most of the newly recognized or modified great soil groups these groups are defined and discussed. The taxonomy is based to a considerable extent upon the concept of a normal or zonal soil. Among the soils which have not been placed satisfactorily in any existing great soil group are the Ando soils which are widely developed on volcanic ash in Japan, the Philippines, Hawaii, Africa and Central America. They have a dark brown to black A_1 horizon with fine-crumb or granular structure, and an organic content averaging 8% and ranging up to 30%. They are strongly to slightly acid in reaction, and in Japan have SiO_2/R_2O_3 ratios of less than 2.

[1262] 631.44 : 551.41
WINTERS, E. **Interpretative soil classifications: genetic groupings.** *Soil Sci.* 67, 1949 (131-139).

Five major kinds of genetic classifications are recognized corresponding to the five factors of soil genesis—relief, time, parent material, climate and vegetation as associated biological agents. Toposequence, chronosequence, lithosequence, climosequence and biosequence are the terms suggested by Jenny for these genetic classifications, catena, another name for toposequence, is discussed, as are the other four classifications.

[1263] 631.44 : 625.7/8
STOKSTAD, O. L.; HUMBERT, R. P. **Interpretive soil classification: engineering properties.** *Soil Sci.* 67, 1949 (159-161).

[1264] 631.44 : 631.471
MOON, J. W.; LIGON, W. S.; HENDERSON, J. R. **Soil classification and soil maps: original field survey.** *Soil Sci.* 67, 1949 (169-175).

Definition and objectives. Types of soil surveys: detailed, reconnaissance and detailed-reconnaissance.

[1265] 631.44 : 631.471
NYGARD, I. J.; HOLE, F. D. **Soil classification and soil maps : units of mapping.** *Soil Sci.* 67, 1949 (163-168).

Relationship between categorical and cartographic units. Definition and use of soil complexes, soil associations and land types. Delineation of units of mapping on field sheets.

[1266] 631.44 : 631.471
ORVEDAL, A. C.; BALDWIN, M.; VESSEL, A. J. **Soil classification and soil maps : compiled maps.** *Soil Sci.* 67, 1949 (177-181).

Compiled maps, as distinct from field-survey maps, are those made in an office and based not on direct field observations, but on published and unpublished data including field-survey maps and geological, topographical, vegetational and climatic data.

[1267] 631.445.2 : 549
MAREL, H. W. VAN DER **Mineralogical composition of a heath podzol profile.** *Soil Sci.* 67, 1949 (193-207). [Agric. Expt. Sta. T.N.O. Groningen]

In a Dutch soil the horizons were: humic sand with roots, lead sand, black sand containing a Fe hardpan just above brown sand, and yellow sand. Podzolization is accompanied by a strong attack of the minerals in the separate $> 16\ \mu$ by humic and organic acids. Resistant minerals (opaque, staurolite, rutile, tourmaline and quartz) concentrated in zones of strong weathering at the expense of amphibole, muscovite, epidote and saussurite. The zircon concentration remained almost the same throughout, increasing only in the 16-60 μ separate. Feldspar showed marked decrease only in the lead sand: apparently some—especially the K—forms are decomposed only by strong acid concentrations and the Ca and Na forms hardly at all: these latter were concentrated, together with quartz, in the $< 16\ \mu$ separate, in which illite and kaolinite moved downward in suspension. Due to the concentration of resistant minerals and strong disintegration of others, the podzol was characterized by an authigenic mineral, boehmite, only slightly aged, found in the $< 2\ \mu$ separate of the yellow sand. The presence of boehmite and hardpan indicate the fossil origin of the podzol. The black sand contained the largest total amount of free silicic acid and amorphous sesquioxides. In the separate $> 16\ \mu$ tourmaline, garnet and saussurite were present mostly as particles of 210-500μ, zircon and rutile 16-60, amphibole 60-210 and staurolite and epidote as 60-500μ particles. Except for quartz, soil minerals were almost absent from the $< 2\ \mu$ separate.

[1268] 631.445.2 : 552.321.1
BERTHOIS, L. Sur une forme particulière de l'horizon illuvial dans les sols podzoliques sur arène granitique. **[On a special form of the illuvial horizon in podzolic soils on granitic sand.]** *C.R.* 228, 1949 (1042-1044). [F.]

The type of soil formed on granitic sand sometimes differs very definitely from a normal podzolic soil by its constitution and depth of penetration of its illuvial horizon. In these soils the illuvial horizon has its origin in the old cracks of the parent rock that form a drainage zone capable of penetrating to a considerable depth.

[1269] 631.445.2 : 631.48
HÉNIN, S.; BÉTRÉMIEUX, R. Essai de pédologie expérimentale. **[An attempt at experimental pedology.]** *C.R.* 227, 1948 (1393-1395). [F.]

In laboratory experiments on the effects of podzolization, glass tubes of 15 cm. in height were filled with a loam soil which was percolated with different solutions. The following observations were made. (1) In a tube percolated with a 1% solution of ammonium nitrate until complete replacement of exchangeable Ca had taken place and washed with small quantities of water, the column of soil assumed the aspect of a leached soil.

(2) When the soil was washed with n/100 solutions of different acids followed by distilled water the effect was the same, but slower.

(3) In tubes where the soil was washed with a solution containing 0.5 to 1% of glucose with 1/10 of an ammonium salt, fermentation developed after 8-10 days and ended in the formation of a gley which finally filled the whole of the lower half of the tube. The filtrate which was at first greenish yellow became markedly red but muddy, then red and translucent, and finally

greenish yellow again. After two months amounts of Fe corresponding to 2% of the soil and an amount of CaO of the order of 1% had been removed.

The same kind of phenomena may be observed in peat soils in nature, the drainage water being markedly red while the gley is developing in the soil.

It is concluded that Fe is displaced in a complex form as it was possible to repeat these observations in the presence of 10% of calcium carbonate, i.e. under conditions where Fe would have been precipitated if it had been in an ionic state. In several cases accumulations of clay were found at the bottom of the tube. The column of soil then looked like a leached soil profile with gley. In another experiment where a layer of soil was placed on coarse sand and percolated with a solution of glucose a gley developed also, but an iron-hydroxide deposit was also formed at the point of contact of the soil and the sand and also in the sand itself giving the whole the appearance of a hardpan. The results indicate the considerable importance which may be attached to the role of fermentations in the transformations of Fe in the soil.

[1270] 631.445.51
SMITH, R. **A comparison of the reddish chestnut soils of the United States with the red-brown earths of Australia.** *Soil Sci.* 67, 1949 (209-218). [Commonwealth C.S.I.R.]

The two groups of soils were chosen for comparison because of the large number of profile descriptions available. The basis of comparison is therefore the soil profile itself rather than some form of climatic index which is the more usual basis for comparison. The general environment of the two groups of soils is described and data are presented describing representative soil series of these soil groups. From these it has been possible to formulate a generalized description, all the profiles described for both groups falling within the limits of this description. The author, however, hesitates to claim a common identity for these two groups as he considers that existing great soil groups are not sufficiently well defined.

[1271] 631.445.52 : 631.821.2
KLOPOTOVSKY, B. A. **[Relict gypseous solonchaks ("gazh" soils) of South Georgia.]** *Pochvovedenie* 1949 (110-114). [R.]

The soils, formed on dolerite in the valley of the river Kura, consist of a well developed humus horizon underlain at a depth varying from 20 to 60 cm. by a loose, highly gypseous "gazh" horizon. The gypsum content can reach 60%, and the depth of the horizon 50 cm. The "gazh" horizon lies directly over dolerite lava with a sharply defined boundary between them. There is evidence that the gypsum is formed from sodium sulphate leached out of solonchak soils on the steep slopes of the valley and interacting with lime in the weathered dolerite. This probably took place in late quaternary times; it is not taking place at present.

[1272] 631.445.7 : 549
KIEL, H.; RACHMAT HARDJOSOESASTRO, R. Voorlopige mededeling over het mineralogisch onderzoek van bodemprofielen. **[Preliminary communication on the mineralogical study of soil profiles.]** *Landbouw* 20, 1948 (281-290). [Du.] [Alg. Proefst. Landb., Buitenzorg]

The distribution of various minerals in the profiles of a podzol and a lateritic soil is described.

[1273] 631.445.7 : 631.483
UTESCHER, K.; ABEL, A.; DOMKE, W. Klima und Bodenbildung. Bauxitische Verwitterung. **[Climate and soil formation. Bauxitic weathering.]** *Z. PflErnähr. Düng.* 40, 1948 (206-237). [G.]

Soil-sampling sites were widely distributed in mountain and coastal districts of Cameroon. The districts were grouped according to locality, altitude and average annual rainfall.

Soil colour is not an index of humus content and the extent of bauxite formation; the dark brown or chocolate-coloured soils have generally at least 4% of humus, but there are some with only 2.4%, whereas there are soils with up to 17% of humus that are greyish brown. Further the red or brown colouration is not a sure guide to the existence and amount of free clay. Free clay was detected in all districts, the amount generally being greater in subsoil than in top soil. The experiments did not confirm the current

view that free clay results from climatic changes, but rather indicated that bauxite formation occurs under hot, humid conditions. Bauxite formation under high rainfall and temperature is due not to the splitting of soil silicates and leaching of bases, but to the partial cleavage of the silica-clay radical and removal of the silica. The result of this splitting is that comparatively small amounts of unsaturated compounds remain in the soil and the acidity is kept within moderate limits.

Humus content is maximum (9-10%) in rainy districts; in low-rainfall areas it is only 1-2%. The stability factor is extremely low (<0.6). Green manuring is of special value in humus-deficient districts.

Total citrate-soluble P and K are very variable. The P is strongly fixed by Fe compounds. The content of exchangeable bases depends on rainfall. It decreases with increasing leaching by high and uniformly-distributed rainfall. The exchange complex deteriorates with the leaching of Ca.

In regard to cropping the following conclusions are drawn. Soils with a low content of fine soil or predominantly gravel subsoil are not cultivable because of lack of nutrients and low water-holding capacity. Highly bauxitic soils with over 7% of free clay are also unsuitable because splitting of the silicate complex leads to nutrient deficiency, particularly lime deficiency, accompanied by deterioration in physical properties of the soil. P and K status of the soil must be determined at individual sites. The calcium factor is the most important on these soils. The exchange complex should contain 80-90% of divalent bases of which 60-70% should be calcium.—K.S.

[1274] 631.445.71

SETZER, J. Terras roxas encaroçadas. **[Purple-red lateritic soils of stable aggregation.]** Repr. *An. Brasil. Econ. Flor.* 1, 1948, pp. 9. [Pt.e.]

The purple-red lateritic soils studied were (1) terra roxa "legitima", a strongly-aggregated clay containing only 10% of sand, which was black and composed of magnetite and ilmenite and (2) and (3) terra roxa "misturadas", much less aggregated soils from a mixture of diabase and sandstone detritus that contained 20% of sand of which 15-20% was white quartz; (2) was more aggregated than (3). The soils had developed under high dense virgin forest about 200 miles north of San Paulo, and had given 5 years of excellent maize, 50 years of over-grazed pasture and 5 years of cotton, the production of which was fair from (1) and poor from (2) and (3) in spite of quite heavy fertilizing.

Soil data include :—

Soil	Humus %	Total PO_4 m.e.	Exch. bases m.e.	pH
1	3	9	8	6.6
2	2	9.5	4.5	5.9
3	1.8	9	3	5.5

Mineral-colloid composition was as follows :

Soil	SiO_2 %	Al_2O_3 %	Fe_2O_3 %	TiO_2 %	SiO_2/R_2O_3
1	12.5	17.5	22.5	9.5	0.68
2	12	19.5	27	10	0.55
3	11	21	26	5.5	0.52

Aggregation was of great aid in judging fertility in these soils. Organic matter and ground limestone would improve aggregation and fertility and K is the most important mineral fertilizer required.

631.452/3 FERTILITY. TOXICITY

(*See also* Abs. No. 1190)

[1275] 631.452 : 619

WHITTLES, C. L. **Soil fertility and health.** *Vet. Rec.* 61, 1948 (38).

Deficiencies of Ca, P, K, Mg and minor elements are discussed.

[1276] 631.453 : 546.19

THOMPSON, A. H. ; BATJER, L. P. **Helpful soil treatment for correcting arsenic injury to peach trees planted on toxic soils.** *Proc. Wash. St. Hort. Assoc.* 44, 1948 (207-208). [U.S.D.A., Wenatchee, Wash.]

Recovery was in most cases outstanding when $ZnSO_4$ was combined with a high N treatment. In highly alkaline soils the addition of S was helpful. In most cases the work was done under ordinary irrigation conditions. In one case however where trees were growing on a very alkaline soil the irrigation practice was changed in that the soil was kept moist all the time, almost to the point of over-watering. Under this treatment the trees which had previously not been responding well to the Zn, S and N applications showed a rapid improvement. It is suggested that $ZnSO_4$ should be applied once at the rate of about 8 lb./tree for trees three years old or older. The N (applied $\frac{1}{2}$ in December or January and $\frac{1}{2}$ in May or June) should, like the $ZnSO_4$, be broadcast in a circle of about 3 feet in diameter. For trees one and two years old an application of about 2 lb. of $ZnSO_4$ in a circle 4 feet in diameter is suggested. The $ZnSO_4$ can be applied at any time.

[1277] 631.453 : 546.22

EHRENCRON, V. K. R. De ongunstige invloed van zwavelhoudend afvalwater op sawahgronden en visvijvers. **[The undesirable effect of waste water containing sulphur on sawah soils and fish ponds.]** *Landbouw* 20, 1948 (291-298). [Du.] [Alg. Proefst. Landb., Buitenzorg]

Water and soil samples from affected and unaffected sawahs irrigated with water from the Tjiwidej were examined. Waste material, known as "sulphur ash," was carried from a sulphur factory farther up the river. Injury was not caused by the original material carried by the irrigation water, but where "sulphur ash" with a high content of free S was applied to the sawahs a toxic medium was formed as the result of microbiological activity and the crop was ruined. Results also showed that injury is accompanied by high acidity, a high proportion of insoluble S compounds and soluble sulphates. The critical values were pH < 3.5, insoluble S compounds $> 0.5\%$ and soluble sulphates $> 0.25\%$. Fish culture was impossible.

[1278] 631.453 : 668.731

GOUÈRE, A. Observations sur certaines pertes de fertilité résultant de faits de guerre. **[Certain losses of fertility due to wartime works.]** *C.R. Acad. Agric.* 35, 1949 (161-164). [F.]

Considerable areas of podzolic soils near Bolleville (Manche) were levelled and covered with tarred paper and tarpaulin for aviation purposes. The truncation and burial of profiles and the toxic effects of the tar resulted in widespread infertility when the area was returned to cultivation. Removal of the remaining broken-up sheets of tarry material and avoidance of their further subdivision in cultivation is the first need. Where acid horizons now form the surface, green manure and fertilizers should be used to build up a new humiferous horizon.

631.459 SOIL EROSION

(*See also* Abs. Nos. 1477, 1549, 1559, 1589)

[1279] 631.459 : 525.5

CARREKER, J. R. ; BARNETT, A. P. **Runoff and soil loss measurements by cropping periods.** *Agric. Engng.* 30, 1949 (173-176). [S.C.S., Watkinsville, Ga.]

Measurements of run-off and erosion were made on 3, 7 and 11% slopes of different length and cropped with continuous cotton or cotton and cover crops. Erosion increased very markedly, and run-off less markedly, with steepness of slope. Great variations were observed from year to year in the amount of soil lost, independently of the rainfall. Under continuous cotton and on a 7% slope 52% of the erosion and 34% of the run-off occurred in the summer (June-Aug.). The dead residues of summer cover crops gave better protection against winter erosion than did winter cover crops which gave inadequate protection. Perennial cover crops like lespedeza and kudzu gave excellent erosion and run-off control on the steepest slope.

[1280] 631.459 : 581.5
ROBERTSON, F. C. F. **The influence of vegetation on floods.** *Inst. Civ. Engrs. Proc. Conf. Biol. Civ. Engng. 1948*, 1949 (64-74).

Examples are given to show that run-off is much greater from bare or structureless soils than from soils covered with vegetation. Both forest and grass are highly efficient in preventing excessive run-off, but in some natural forest areas, e.g. the Swiss Alps, forest seems to be more effective than grass. Forest litter is shown to be an important factor in absorbing rainfall. It is estimated that, in general, peak flows from catchments well covered by vegetation should not exceed 100 seconds-feet per square mile.

[1281] 631.459 : 631.416
KURON, H. Veränderungen der Ackerböden unter dem Einfluss der Bodenerosion. **[Changes in arable soils under the influence of soil erosion.]** *Z. PflErnähr. Düng.* 41, 1948 (245-258). [G.]

32 series of 4 profiles (256 soil samples) were examined in sandy soils of Pomerania, Mecklenburg and Brandenburg Mark. In each series the members were taken from (1) the flat ground at the top of a slope, (2) the upper and (3) the lower part of the slope, and (4) the lowest lying ground. The distribution in the profile series of humus, P, K, clay fraction (below 0.002 mm.), fine particles (0.06-0.002 mm.) and hygroscopic water-holding capacity was examined. The results show the considerable migration of the top soil from the high land and slopes to the lower ground, resulting in the general impoverishment of the slope soils in humus and P and to a less degree in K. The decline in available reserves in the subsoil is particularly marked.—K.S.

[1282] 631.459 : 631.61
LIGHTFOOT, L. C. **Soil conservation. Methods for the control of water erosion.** *J. Dept. Agric. W. Aust.* 25 (S.S.) 1948 (390-411).

[1283] 631.459 : 631.61
FARMING IN SOUTH AFRICA. **Financial assistance for soil-conservation works. Financial assistance in terms of the Soil Conservation Act No. 45 of 1946 and the regulations framed thereunder, as announced by the Minister of Agriculture and Forestry on February 28th.** *Farm. S. Africa* 24, 1949 (179-180).

[1284] 631.459 : 631.61
TAYLOR, T. P. **Control of gully erosion, holding dams and diversions.** *J. Soil Conserv. Serv. N.S.W.* 5, 1949 (15-23).

Gully erosion is best controlled by soil-conservation practices on the catchment itself. Further works which may be needed to prevent gullies extending include the construction of diversion banks around a gully head with provision of disposal areas for the water diverted from the gully, or of a holding dam above the gully to hold the run-off.

[1285] 631.459 : 631.61
WALKER, B. S. **Soil conservation in the North-West. Some observations at Gunnedah Research Station.** *J. Soil Conserv. Serv. N.S.W.* 5, 1949 (24-29).

The combination of mechanical and vegetative control measures adopted has been highly effective in reducing erosion and run-off. Queensland Blue Grass (*Dicantheum sericeum*) is one of the earliest of the local species to recover when an area has deteriorated badly, and is a valuable colonizer of eroded areas. A grade of 0.5% as favoured on some other wheat-belt soils is too steep for graded banks on cultivated land in the self-mulching soils of this area. A grade of 0.2% is safer for this type of soil.

[1286] 631.459 : 631.61 : 33
SAUER, E. L. **Economics of soil conservation.** *Agric. Engng.* 30, 1949 (226-228).

Net income from 20 "high-conservation" farms in Illinois was consistently higher over the 10 years 1936-45 than from 20 similar "low-conservation" farms. Yields of the high-conservation farms increased, and of the low-conservation farms decreased, over the period. There was a slight reduction in labour, power and machinery costs in favour of cultivating on the contour as against up and downhill. More livestock were produced on the high-conservation farms, and more milk and meat were produced from them for equal expenditure on food; the reason for this is not clear, and it is suggested it may be due to higher-quality feed produced on high-conservation farms. An important economic problem which requires solving is the proper division of increased costs for conservation improvements and increased returns between landowner and tenant. Where livestock

numbers are increased it may be advisable to substitute livestock-share leases for crop-share-cash leases, as conservation practices are more readily adopted under such a lease. Leases should also contain provision for compensating tenants for the residual value of conservation improvements.

[1287] 631.459 : 631.613
HARROLD, L. L. **Soil loss as determined by watershed measurements.** *Agric. Engng.* 30, 1949 (137-140).

Contour cultivation with sod waterways resulted in large reductions of soil loss. The greatest reduction appeared to come soon after contour cultivation, when reductions up to 75 and 80% were not uncommon. Thereafter the reduction fell off to around 20%. For the entire year the reduction averaged 66%. Mulch culture for contoured maize land had the best record for erosion control with over 90% reduction in soil loss. The largest amount of soil loss for any one storm on the mulched areas was 0.25 tons per acre, and on contour-ploughed maize land 6.5 tons per acre. Winter mulch of manure on wheat land is an effective factor in erosion control.

[1288] 631.459 : 631.613
VORSTER, J. A. **Soil erosion and some problems connected with its control.** *Inst. Civ. Engrs. Proc. Conf. Biol. Civ. Engng. 1948*, 1949 (48-63).

Conservation farming is defined as "extracting from the soil all that is possible by means of sound husbandry and the application of engineering techniques in order to keep the soil permanently productive." The applicability of the run-off formula

$$Q = C\,I\,A,$$

where Q is the rate of run-off from a catchment, C is a run-off coefficient, I is the expected rainfall intensity, and A is the area of the catchment, is discussed, and it is concluded that it can serve only as a rough guide in the design of anti-erosion structures.

[1289] 631.459 : 631.67
GILARDI, C. A. La erosion de los suelos por el riego en la Costa y Sierra del Pais. [**Erosion due to irrigation on the coast and in the hills.**] *Cent. Nac. Investig. Agric. La Molina Inf.* 68, 1948, pp. 6. [Sp.]

In a coastal cotton field in which the irrigation furrows are up to 600 m. long and with a gradient of 0.8%, soil is being removed by irrigation at the rate of 156 kg./m². in 20 years, equivalent to 4 inches of soil. Loss of fertility in some irrigated or rain-fed hill lands terraced in pre-Inca times is attributed to encroachment by the plough on the naturally vegetated and water-retarding strip, 3 or more feet wide, customarily left unploughed below each terrace.

631.46 SOIL MICROBIOLOGY

(*See also* Abs. Nos. 1195, 1386, 1409, 1501)

[1290] 631.461
FEHÉR, D.; FRANK, M. **Researches on the geographical distribution of soil microflora. I. The geographical distribution of soil bacteria.** *Mitt. Bot. Inst. Univ. Sopron* 15, 1947, pp. 39. [E.]

Ninety soil samples from widely-different parts of the world were investigated and 217 species of heterotrophic soil bacteria were determined and their distribution recorded. In some European forest and North African desert soils the occurrence of nitrogen-fixing and nitrifying bacteria was established, including in forest soils with pH values of 5-6. Only the Actinomyces and some Bacilli appear to have a great adaptability to the conditions of alkali and desert soils. The most common bacterial species appear to be world-wide in distribution and it is as yet impossible to establish the presence of characteristic bacterial flora for particular geographical areas and soils.

[1291] 631.461
MISHUSTIN, E. N. [**The role of spore-forming bacteria in soil processes.**] *Mikrobiologia* 17, 1948 (201-207). [R.] [Moscow]

Spore-forming bacteria are concerned in the advanced stages of the decomposition of organic residues in the soil. They seem able to use organic better than inorganic N, and appear when protein has been microbially synthesised.

[1292] 631.461 : 581.144.2

LOCHHEAD, A. G. **Plant growth in relation to the bacterial equilibrium in soil.** *Trans. Roy. Soc. Canada* 42, Sect. V, 1948 (73-80). [Dept. Agric., Ottawa]

Since equilibrium between groups of organisms in soil depends on the availability of nutrients required for growth, soil bacteria have been classified according to their nutritional needs. Studies of the "rhizosphere effect" on the balance between different nutritional groups indicate that the growing plant is the main factor affecting the equilibrium. Associative and antagonistic effects may play a part in establishing the microbial balance.

[1293] 631.461 : 581.144.2

TIMONIN, M. I.; LOCHHEAD, A. G. **Distribution of micro-organisms in the rhizosphere of a root system.** *Trans. Roy. Soc. Canada* 42, Sect. V. 1948 (175-181). [Dept. Agric., Ottawa]

The density of bacteria, fungi and algae in the rhizosphere decreases with increasing distance horizontally and vertically from the base of the stem. Protozoa were found only in the surface samples of rhizosphere soil. In the upper soil, nitrifying organisms showed little decrease in numbers with distance from the stem, but cellulose-decomposing bacteria were much more numerous in the rhizosphere at the base of the stem than in the younger parts of the root system. In a vertical direction from the base of the stem, bacteria with the simplest requirements tended to become less abundant.

[1294] 631.461 : 631.51

MISHUSTIN, E. N.; SHUKOWSKAIA, P. N. Der Einfluss des Pflügens auf die Tätigkeit der Mikroorganismen im Boden. **[The effect of ploughing on the activity of soil microorganisms.]** *Z. PflErnähr. Düng.* 43, 1949 (154-160). [G.] [Inst. Microbiol., Acad. Sci., U.S.S.R.]

In experiments covering 2 years, 2 podzols received the following treatments: (1) loosening by spading to a depth of 5 cm., (2) loosening to 20 cm. in 4 layers which were removed, thoroughly loosened and returned in the same order, (3) as for (2) but with the layers returned in the opposite order, and (4) turned by spade to a depth of 20 cm. The number of saprophytic bacteria in the 20 cm. of topsoil was approximately doubled by (3) and (4), but was much less affected by (1) and (2). The number of nitrifying bacteria was increased by 58% by (3) and (4) over (1) and (2), and of cellulose-decomposing bacteria by a rather higher percentage. Oat yields with the 4 treatments were 11.9, 17.8, 30.6 and 30.2 dz./ha. respectively. Turning the soil also had "a great effect on the development of azotobacter."

[1295] 631.461.1/3 : 547.458.5

BODEA, C.; PRECUP, E. Recherches sur la décomposition biochimique de l'amidon par rapport à la réaction du sol. **[Studies on the biochemical decomposition of starch in relation to the reaction of the soil.]** *An. Fac. Agron. Cluj 1946-1947*, 12, 1949 (130-134). [F.]

Samples of a calcareous soil were treated with HCl to bring them to various pH values between 8.90 and 3.94, washed free of chloride, calcined to destroy organic matter, and 0.1 g. of soluble starch added to 10 g. of soil. The samples were inoculated with a manure extract, and kept at room temperature for 35 days, after which the remaining starch was determined by extracting with hot water, evaporating the extract and igniting the residue. $\frac{1}{2}$-$\frac{2}{3}$ of the starch was decomposed at pH values between 9 and 6 with an apparent maximum at pH 7. Below pH 6 decomposition was much slower.

[1296] 631.461.1/3 : 636.086.25

TEPPER, E. Z. **[The micro-organisms taking part in the aerobic decomposition of spring-cereal straw and formation of humus-like matter during this process.]** *Pochvovedenie* 1949 (175-182). [R.]

Bacteria are the principal micro-organisms taking part in the aerobic decomposition of straw, while humification is the province of *fungi imperfecti*, particularly *Fumago* and *Botrytis*, which are capable of synthesising dark substances in their cells.

[1297] 631.461.3

FRAPS, G. S.; STERGES, A. J. **Nitrification capacities of Texas soil types and factors which affect nitrification.** *Tex. Agric. Expt. Sta. Bull.* 693, 1947, pp. 60.

Experiments on several Texas soils showed that inoculation with nitrifying bacteria considerably increased the capacity to nitrify $(NH_4)_2SO_4$ in 40-50% of the surface soils and 40-85% of the subsoils. The addition of

$CaCO_3$ also increased nitrification, especially in soils of low nitrifying power and surface soils, but in some cases P also was required. In general, soils with low nitrifying capacities had low N contents and basicities. Low nitrification of $(NH_4)_2SO_4$, however, was not necessarily accompanied by low nitrification of organic N, and differences in the ability of soils of the same N content to provide crops with N may be partly related to differences in the percentages of nitrifiable N. During incubation, the numbers of nitrite-forming organisms increased from 10,000 to 20,000 per g. in 21 days—the time of maximum oxidation—and then decreased, while the numbers of nitrate organisms reached a maximum at 28 days. Nitrites were not always completely oxidized to nitrates, especially if $CaCO_3$ or $MgCO_3$ were added. Variations in water content did not appreciably affect nitrification, but in puddled soils with water contents of 75% and 85% of the water capacity the amounts of soil N and $(NH_4)_2SO_4$ nitrified were 25 and 60%, and 6 and 40%, respectively, of that in unpuddled soils, and $NaNO_2$ was not completely converted to nitrate. No appreciable nitrification occurred in waterlogged soils. In 23 soils, 43% of the N in $(NH_4)_2SO_4$ was nitrified in 23 days. Corresponding percentages for other salts were: NH_4 oxalate, 59; NH_4 acetate, 53; NH_4 tartrate, 57; NH_4 citrate, 56. The lower nitrification of $(NH_4)_2SO_4$ appears to be due chiefly to the high acidity of the sulphate ion released. The proportion of N in cottonseed meal that was nitrified in 28 days was lower than that in $(NH_4)_2SO_4$, but was raised by the addition of $CaCO_3$ or inoculating liquid. The addition of cottonseed oil, starch, cane sugar, grapefruit peel and pecan shells depressed nitrification; cocoa shells had little effect. The depressing effect of $CaCN_2$ on nitrification of soil organic matter, $NaNO_2$ and $(NH_4)_2SO_4$ when applied at more than 100 p.p.m. persisted for 6-10 months. Of the $CaCN_2$ derivatives, urea nitrified readily, guanidine carbonate was partially, and guanylurea slightly, nitrified, while dicyandiamide depressed nitrification. Ground S at rates of 0.5, 1.0, 1.5, 2.0 and 5% decreased nitrification even though the soil pH was more than 7. In some soils of low nitrifying capacity, nitrification was increased by additions of $CaHPO_4$, $MgSO_4$ and $FeSO_4$.

[1298] 631.461.3

ALLISON, F. E.; STERLING, L. D. **Nitrate formation from soil organic matter in relation to total nitrogen and cropping practices.** *Soil Sci.* 67, 1949 (239-252).

Studies on Cheyenne fine sandy loam, under various agronomic treatments, to determine to what extent nitrate formation can be used as a measure of availability of N in soil organic matter indicated: the variations in quantities of nitrate formed from soil of identical agronomic history were no greater than would be expected from the corresponding crop-yield data; nitrate formation was directly correlated with total soil N, and in unlimed soils the amounts formed per unit of N present increased markedly as total N increased, including when $(NH_4)_2SO_4$ was added. The fact that in limed soils nitrate formation was not quite proportional to total N is explained by the lower content of exchangeable bases in the low-N soils. In 8 weeks of incubation the pH of soils receiving (a) 0.1% of $(NH_4)_2SO_4$ and (b) no $(NH_4)_2SO_4$ decreased by (a) 1.6-1.9 units and (b) 0.3-0.5 unit. The rate at which soil N was oxidized to nitrates under ideal conditions was rather high: 2.7% for the 42-day period, with a maximum of 3.9%, and 8.7% in 186 days with a maximum of 14.4%. In the given soil type and under like climatic conditions, thoroughly humified soil organic matter is fairly uniform in quality regardless of past agronomic treatment.

[1299] 631.461.3 : 632.95

SMITH, F. B.; BELL, C. E. **Interrelationship of microbiological action in soils and cropping systems in Florida.** *Fla. Agric. Expt. Sta. Rept.* 1946-47 (97).

DD, chloropicrin, DDT and 2,4-D had an initial depressing effect on nitrification in fine sandy soil. DD had a stimulating effect after 21 days, but the depressing effect of DD and 2,4-D was still apparent after 70 days; chloropicrin was most effective in checking nitrification. 25 lb./acre of $CuSO_4$ slightly stimulated nitrification for 4 weeks after application, but 100 lb./acre had a slightly depressing effect. Applications of 10-400 lb./acre of Mn and Zn sulphates had no apparent effect on the oxidation of $(NH_4)_2SO_4$. B and lime stimulated nitrification. Initially, 20 lb./acre of borax was more effective than 10 lb.; 1500 lb./acre of

limestone + borax was more effective than borax alone. After 4 weeks 10 lb. of borax was as effective as 20 lb. and borax was as effective as borax+limestone.

[1300] 631.461.5 : 631.416.1
BHAT, J. V.; PALACIOS, G. **Studies on the influence of some bacterial cultures in the nitrogen status of the soil. I. Influence of *Serratia marescens* in the nitrogen status of soil. II. Influence of *Bacillus subtilis* in the nitrogen status of the soil.** *J. Univ. Bombay* 16 B, 1948 (15-26). C.A. 43 (795).

Results of experiments with sterile soils and soils inoculated with 0.1 c.c. of *Serratia marescens* culture showed that darkness and moisture were beneficial for N fixation by this organism. The organism did not survive for 30 days in the dry sample exposed to direct sunlight.

In a water-logged sample, *Bacillus subtilis* continuously changed insoluble N to soluble N, some of which was lost to the air. Losses in total N of the dry samples kept in darkness were smaller than those in samples kept in daylight, but conversion of total to soluble N was also much less, indicating decreased bacterial activity in darkness.

[1301] 631.461.51 : 631.415.1
BLINKOV, G. N. **[The influence of the reaction of the medium on the intensity of nitrogen fixation and the growth of azotobacter.]** *Mikrobiologia* 17, 1948 (49-54). [R.] [Tomsk Pedagogic Inst.]

The influence of reaction on the growth of *A. agile*, *A. vinelandii* and *A. chroococcum* was tested in cultures over the range pH 6-8. Maximum growth and N fixation occurred between pH 7.3 and 8.

[1302] 631.461.52
WILSON, J. K. **Symbiotic segregation of strains of the root nodule bacteria by leguminous plants.** *Cornell Agric. Expt. Sta. Mem.* 279, 1948, pp. 23.

Seedlings grown under sterile conditions were exposed simultaneously to two or more diverse strains of nodule bacteria which were known to be effective on the species of legume used. The strain which had caused the formation of each nodule was determined by its ability to effect nodulation on certain species. Depending on the strain used, the plants symbiosed with only one, or with two or more strains simultaneously. In some combinations the plant did not bear nodules after exposure to the strain from it but did with the companion strain from another genus or species. The relations of this segregating action by the plant to the classification of the bacteria and to various factors influencing nodulation are discussed. The segregating action of 8 genera and 62 species of legume was investigated.

[1303] 631.461.61
BODEA, C.; MURESANU, P. L. **[Stimulating action of *p*-aminobenzoic acid on the biochemical decomposition of cellulose.]** *Bul. Soc. Şti. Cluj* 10, 1948 (137-141). C.A. 43 (3609). [F.]

Decomposition of cellulose in moist soil was stimulated by the presence of 0.1 mg. of *p*-aminobenzoic acid in 10 g. of soil. The soil samples contained either $NaNO_3$ or glycine. If *p*-aminobenzoic acid was omitted, slower decomposition took place and if sufficient was added to supply as much N as that of the $NaNO_3$ and if the $NaNO_3$ and the glycine were omitted very little decomposition took place. The experiments were carried out at the pH values 8.9, 8, 7.1 and 4.9 and covered 16-26 days.

[1304] 631.461.61
BODEA, C.; MURESANU, P. L.; PRECUP, E. **[Biochemical decomposition of cellulose.]** *Bul. Soc. Şti Cluj* 10, 1948 (37-43). C.A. 43 (3609). [F.]

Various N compounds were added to 10 g.-samples of soil containing 0.1 g. of cellulose. After inoculation with cellulose-decomposing micro-organisms the soil samples were incubated for 15-31 days at constant temperature and humidity. The water-soluble compounds of N were more effective than insoluble compounds in promoting microbial decomposition.

[1305] 631.462
KOOT, Y. VAN; BAKKER-BEER, E. Factoren die invloed uitoefenen op de resultaten van het stomen van grond. **[Factors influencing the effect of soil steaming.]** *Meded. Direct. Tuinb.* 12, 1949 (120-133). [Du.e.] [Proeft. Zuid-Hollands Glasdis. Naaldwijk]

In some cases the number of bacteria increased tenfold after steaming; the number of nitrifying bacteria was not quickly

restored to normal, but was still rising after three months. Greater amounts of water-soluble N were found where the proportion of protein-decomposing bacteria in the total numbers remained constant. Unfavourable results were attributed to rinsing of the soil with water after steaming, high moisture content at the end of steaming, lack of organic matter, too frequent steaming, and under-sterilization. Laboratory tests showed that the intensification of bacterial activity by steaming is increased by a high percentage of humus. Previous treatments with steam had no after-effect on bacterial development when steaming was repeated. The higher the humus content of the soil, the larger was the increase of soluble N compounds, but solubility of K was unaffected. Intensity of steaming had little effect on the amounts of soluble N and K.

[1306] 631.462

SIMPSON, F. J. ; NEWTON, J. D. **Studies on steam sterilization of soils. II. Some factors affecting minimum sterilization requirements.** *Canad. J. Res.* 27, 1949 (1-13). [Dept. Soils, Univ. Alberta, Edmonton]

Longer periods of exposure to obtain sterility were necessary with increases in weight and depth of the sample. Different soils had also different sterilization requirements. The rate of steam penetration was uniform for different soils, but the organic matter and texture probably modified the rate of penetration of heat in the soil atmosphere to the centre of the soil aggregates. The size of aggregates and the colloid content of the soils increased in the same order as difficulty of sterilization. Moistening large samples prior to autoclaving greatly reduced the time required to reach 120°C. and to obtain sterility, but had no similar effect on small samples. A moisture content of 75% of water-holding capacity was optimum. With the exception of peat, the small changes in ammonia- and nitrate-N contents of the soils caused by minimum sterilization treatments (at a steam pressure of 15 p.s.i. gauge) were not greater than normal variations found to occur in soils under natural conditions. By autoclaving soils in very shallow layers it appears possible to achieve sterility quickly and without radical alteration.

631.468 SOIL FAUNA

[1307] 631.468

JAHN, E. Die Bodentiere des Waldes. **[Soil fauna of forests.]** *Cbl. ges. Forstw.* 70, No. 1, 1947 (65-80). For. Abs. 10 (291). [G.]

A review of literature with special reference to ecology and to the relationship between soil-population levels and environment.

[1308] 631.468

DRIFT, J. VAN DER De bodemfauna in onze bossen. **[The soil fauna in our woodlands.]** *Ned. Boschbouw Tijdschr.* 1949 (31-43, 67-76). [Du.]

Woodland soil fauna are classed into 4 size groups, micro-, meso-, macro- and mega-fauna, the limits set being such that the mean length of organisms in each class is 10 times that of the previous class. The lines of demarcation at 0.2, 2 and 20 mm. place the rhizopods in the micro-class ; mites, rotifers, nematodes, etc., in the meso-class ; beetles, spiders, millipedes, etc. in the macro-class ; insectivora, earthworms, etc. in the mega-class. The fauna can be divided also into true soil inhabitants (enedaphon), litter inhabitants (hemiedaphon) and surface inhabitants (epedaphon). Further subdivision into preferential litter-layer inhabitants is possible.

The fauna may also be classed as aphagous (pupae, etc.), phytophagous, saprophagous, predators, parasites, fungivores, necrophagous and coprophagous.

Certain data of mesofauna and macrofauna populations are recorded for litter layers. Laboratory culture experiments on litter substrates designed to measure the consumption of litter of various ages by common species (*Julus scandinavius*, *Cylindrojulus silvarum*, *Glomeris marginata*, *Tipula scripta* and *Dendrobaena* sp.) are described. The millipede *Cylindrojulus silvarum* at 7 mm. length conserved 57% of its live weight of F beech litter, at 9 mm. 37%, at 18 mm. 29% and at 25 mm. 9%. A calculation shows that about 7% of the litter falling annually on woodland soil is decomposed by *C. sylvarum* in the 6 summer months.—K.S.

[1309] 631.468 : 595.2 : 633.2.03
SALT, G.; HOLLICK, F. S. J.; RAW, F., ET AL. **The arthropod population of pasture soil.** *J. Anim. Ecol.* 17, 1948 (139-150). [Univ. Cambridge]

The arthropod population of a field which had been under grass for 10 years was studied by methods used for wireworm surveys. The soil was sampled monthly in the 0-6 and 6-12 inch layers. In the November sample 42,753 arthropods, representing a density of 1068.8 millions per acre, were collected but this does not represent a complete population owing to the coarseness of the sieves. The upper layers were more densely populated than the lower, and the smaller arthropods more numerous than the larger.

[1310] 631.468 : 631.416
KÜHNELT, W. Der Anteil der Tierwelt am Stoffumsatz im Boden. **[The effect of the soil fauna on chemical changes within the soil.]** *Bodenkultur* 2, 1948 (49-53). [G.]

A review with 30 references.

[1311] 631.468 : 631.427.2
FORSLUND, K.-H. Något om insamlingsmetodiken vid markfaunaundersökningar. **[Notes on methods of collection in soil-fauna investigations.]** *Medd. Skogsforsk-Inst.* 37, No. 7, 1949 (1-22). [Sw.g.]

A quantitative and qualitative comparison was made of the fauna collected in 100-c.c., 24-c.c. and 1-c.c. samples of raw humus from a coniferous forest. The fauna from the two larger samples was collected on a funnel apparatus, and was washed out of the smallest sample with alcohol. The smallest samples contained 3-4 times as many animals per c.c. as the larger samples, but only about one-third of the number of species. It is concluded that the filter apparatus is unreliable for quantitative analysis of the soil fauna.

631.468.516 EARTHWORMS

[1312] 631.468.516
HOPP, H. **The ecology of earthworms in cropland.** *Proc. Soil Sci. Soc. Amer. 1947*, 12, 1948 (503-507). [S.C.S. Beltsville, Md.]

In sod, young earthworms were fewest in spring, increased during summer and reached their peak in early autumn. Mature earthworms were fewest in early autumn, increased to a peak in late spring and declined during summer. In tilled plots, earthworms were largely destroyed by the first frost; later in the winter they could tolerate temperatures below 32°F. The population was small in spring and summer; young earthworms increased in early autumn and mature ones in late autumn. Survival through winter varied with the amount of debris present on or just beneath the soil surface. The population just before freezing varied with the amount of organic matter returned to the soil during the crop year.

[1313] 631.468.516 : 631.544.7
SLATER, C. S.; HOPP, H. **Relation of fall protection to earthworm populations and soil physical conditions.** *Proc. Soil Sci. Soc. Amer. 1947*, 12, 1948 (508-511). [College Park, Md. and S.C.S., Beltsville, Md.]

Soil protection in autumn with lespedeza mulch, straw, manure, clover and grass, paper bag, combine residue or sod increased the earthworm population, the water stability of soil aggregates and infiltration.

631.47 SURVEYS

(*See also* Abs. Nos. 1264, 1265, 1266, 1514)

[1314] 631.47
SMYTHE, L. E. **Soil science in Fiji—Part IV. (continued). Soil survey—its role in land classification for land-use planning.** *Fiji Agric. J.* 19, 1948 (42-45).

Discussion based mainly on U.S. work.

[1315] 631.471
FINK, J. Zur Frage der Methoden der Bodenkartierung. **[Methods of soil mapping.]** *Bodenkultur* 2, 1948 (209-216). [G.]

The soil maps so far prepared in Austria cover about 1/5 of the country, mostly to a scale of 1 : 10,000. They include the form in which soil characteristics are indicated by hachure, colour and lettering, and Till's syllabic maps. These are described, illustrated and compared with the U.S. 1:48,000 and small-scale maps.

[1316] 631.471
MUIR, A. **Soil surveys.** *Sci. Hort.* 9, 1949 (15-22).

A revision-course paper on various aspects of a soil survey including soil classification, colour, texture, structure, constitution, depth, mapping, evaluation.

[1317] 631.472.005
BENTLEY, C. F.; ODYNSKY, W. **Minimizing the field time required for preparing permanent soil profiles.** *Agron. J.* 41, 1949 (99-100). [Univ. Alberta, Edmonton]

A modification of the Smith and Moodie method of taking soil profiles (*Soils and Fert.* X, p. 427) is described.

A portion of the exposed section is smoothed to a plane surface, the soil is cut away from the two straight edges of a column and a profile box 4-6 inches wide, 2 inches deep and of sufficient length to include the profile is fitted over the column. The soil in the box is cut away from the bank. The permanent mounting of the profile as described by Smith and Moodie may be done later when the soil has dried.

631.48 SOIL FORMATION

(*See also* Abs. No. 1273)

[1318] 631.48
NIKIFOROFF, C. C. **Weathering and soil evolution.** *Soil Sci.* 67, 1949 (219-230). [U.S.D.A.]

Theories of soil evolution developed by the Russian school are briefly discussed, and it is pointed out that they are based on the assumptions (1) that soil evolution is affected continuously by certain progressive (i.e. irreversible) processes, and (2) that concurrently with these processes certain specifically pedogenic, more or less cyclical processes operate. The resultant is a sort of "evolutionary spiral" rather than a cycle. Evolutionary changes consist not only of development of new characteristics, but also of obliteration of previously acquired characteristics. It is pointed out that the concept of weathering as a continuous, irreversible process would lead to the result that over most of the earth all unstable minerals would long since have been removed from the pedosphere had not weathering been accompanied by continuous processes of erosion, deflation, etc. This continual removal of senile weathering products and the renovation of the weathering crust indicate that soil parent material is not a static product. "The A horizon of every mature, non-cumulative soil develops from the material that previously passed through the stage of the B horizon, rather than directly from the C material." On the other hand, in a cumulative soil (i.e. one formed by gradual sedimentation of parent material) the A horizon develops from fresh sediments settled on the surface, and the B horizon develops from sediments that have passed through the stage of the A horizon.

631.5 CULTURAL OPERATIONS

(*See also* Abs. Nos. 1294, 1406)

[1319] 631.51 : 631.581
ILMENEV, S. I. **[Cultivation of bare fallow on podzol soils without reversing the furrow slice.]** *Dokl. Akad. S.-Kh. Nauk* No. 7, 1948 (9-13). [R.]

The use of a deep cultivator (chisel) is considered to be an improvement on ordinary ploughing as less weed seeds are turned up, ploughed-in manure is left at the right depth, moisture is preserved in years of deficient precipitation and yields are almost doubled by this method in comparison with ordinary ploughing. On plots that had undergone deep cultivation the number of aggregates over 0.25 mm. was slightly increased.

[1320] 631.544.7 : 631.415.3
KARNAUKOV, B. G. **[Mulch application on a meadow solonchak soil in the flood plain of the river Don.]** *Pochvovedenie* 1949 (161-168). [R.]

Mulching diminished the evaporation of moisture from the surface layer of soil, the moisture content on unmulched soils varying from 13.4 to 19.2%, and under a mulch of reeds from 36 to 41%. This increase in moisture content was conducive to the gradual leaching-out of salts from the root zone of the soil. Mulching also increased the nutrient content of the surface soil, NO_3 was increased by 15-40 mg./kg. of soil and P_2O_5 by 1.6-2.1 mg./kg. The temperature of the soil was lowered from 45.5° to 27.5° under a mulch during the day time. Potatoes and cabbages developed normally under a mulch and yields were increased six-fold.

[1321] 631.557 : 551.5
BAUMANN, H. Die Ertragsbildung in Rekorderntejahren bei Getreide. **[Crop development in record years in cereals.]** *Z. PflErnähr. Düng.* 40, 1948 (114-129). [G.]

The years 1933 and 1938 produced record grain yields in all districts of Germany. The weather in both years was similar, particularly in March-April and in July-August. March was dry and towards the end was 6-8° C. above normal (80-years average), April temperatures were 5-6° below normal. Rainfall in April was rather below normal, but regional variation was too great for general deductions; there was a hot dry period at the July-August turn. High yields are attributed largely to low assimilation and transpiration losses, particularly at earing and afterwards, and to the generally healthy stand of the crops in the spring.—K.S.

[1322] 631.557 : 551.577
MITSCHERLICH, E. A. Über den Einfluss des Regens auf die Höhe der Pflanzenerträge. **[The influence of rainfall on crop yields.]** *Z. PflErnähr. Düng.* 42, 1948 (5-11). [G.] [Berlin]

The author applies his growth-factor efficiency law to rainfall data obtained from the literature. The growth factor "c" is a constant for all crops, climates and soils and is equal to 0.003 per mm. rainfall. Crop yields (y) obtained on the Dahlem plots and elsewhere agree closely with the yields calculated from the formula, for varying values of x=rainfall in mm. It is possible to calculate the crop increase attainable by irrigation at different water levels and to judge the economics of watering under different soil and fertility conditions.—K.S.

631.58 AGRICULTURAL SYSTEMS

(*See also* Abs. Nos. 1279, 1481, 1587)

[1323] 631.584
EHRENBERG, P.; SCHOLZ, W. Über die Ausnutzung schwerlöslicher Phosphorsäure durch zusammen angebaute Gramineen und Leguminosen. **[On the utilization of difficultly-soluble phosphorus in mixed cropping of grain crops with legumes.]** *Z. PflErnähr. Düng.* 37, 1946 (245-259). [G.]

In pot experiments using sand, rye or oats were grown alone with or without N, peas or lupins alone without N, rye and peas together and oats and yellow lupins together without N. The legumes were inoculated and a basal fertilizing given, the P being given as Algerian rock phosphate containing about 30% of P_2O_5 and small amounts of $CaCO_3$. Both peas and lupins showed P deficiency and the cereals in mixed cropping showed neither a better P uptake due to the presence of the legumes, nor a promotion of growth due to N provided by the legumes. The use of NH_4NO_3 clearly increased the availability of the slightly calcareous rock phosphate to the cereals.

[1324] 631.584 : 633.13 : 635.65
EHRENBERG, P.; ARENZ, B.; BUCHNER, A. Zur Stickstoffernährung von Gramineen in Mischanbau mit Leguminosen. **[The nitrogen nutrition of Gramineae in mixed cropping with legumes.]** *Z. PflErnähr. Düng.* 43, 1949 (122-132). [G.]

In 2 years of pot experiments in which 6 or 12 oat plants were grown with or without 4 or 8 field beans with or without NH_4NO_3, the grain yield was not improved in the first year by mixed cropping although the cereal was of a darker green. In the second year the grain yields were favoured by mixed cropping, possibly due to incomplete removal of roots, etc., after the first harvest.

[1325] 631.588.1
BROWN, C. A. C.; GOLDING, E. W. **Application of electricity to horticulture.** *J. Instn. Elect. Engr.* 95, 1948 (423-438). B.A.BIII, 1949 (7).

The use of electricity and apparatus for soil warming and sterilization, space heating and illumination, pest destruction and water pumping are described.

631.6 RECLAMATION DRAINAGE. IRRIGATION

(*See also* Abs. Nos. 1179, 1529, 1537, 1542)

[1326] 631.61
ELLISON, R. **Reclamation and use of marginal land.** *J. Farm. Club* Pt. 3, 1949 (35-40). Discussion (43-47).

[1327] 631.612

SIPKES, C. Doelbewuste klimaatsverbetering door landschapsbehandeling. **[Climate improvement by landscape treatment.]** *Tijdschr. Ned. Heidemaatsch.* 60, 1949 (72-80). [Du.]

Measures to arrest blown sand consist in planting a line of reeds across the sandy stretch, or making an artificial barrier. Tree breaks, although they improve climate substantially, have to be planted cautiously since they remove large amounts of soil water by transpiration. Recommended species for N. Holland are hawthorn, sand willow, aspen, and on better land, yew, elder and tamarisk. Herbaceous plants are lucerne, incarnate and honey clovers. Rye is sown over the area.

In Friesland (peat colonial) new poplar varieties and *Salix alba calva* which grow quickly, are planted, also hawthorn, blackthorn and, among the conifers, Austrian pine and sitka spruce. *Pinus mugho* withstands wind but not sea wind. The legume *Hippophae rhamnoides* best tolerates sea wind.—K.S.

[1328] 631.613

LADEWIG, J. E. **Building contour banks with a plough by the Island method.** *Queensland Agric. J.* 66, 1949 (135-145).

Description of the "Island system" (with diagrams) which has been developed by the U.S. Soil Conservation Service and is so called because the procedure starts with an island of unploughed soil, on which the contour bank is built.

[1329] 631.613

MAZZEI, E. La sistemazione a girapoggio. **[Contour drainage.]** *Ital. Agric.* 86, 1949 (225-232). [I.]

A description of a system of contour drainage and cultivation initiated about thirty years ago on an estate with an average slope of 20% in the province of Pisa. The system is essentially similar to U.S. contour cultivation. For the contour furrows or drains a fall of 1% was found insufficient to avoid washing-out of the furrow banks; a fall of 2.5% is now adopted. The line of the furrow is marked by posts, and the trace is then ploughed out by a one-way ox plough, and gone over again in the reverse direction, the soil being turned downhill both times thus forming a contoured bank. Hand hoeing then reduces the slope of the uphill face of the furrow, and adds more soil to the bank, leaving a continuous contour drain about 25 cm. wide and 20 cm. deep with a low terrace below it. Just before joining the collectors the drains are turned slightly uphill to allow some sediment to be deposited. An unploughed margin of 1 m. above the furrow-drain is required and normally below the bank also, but on steep slopes more lower margin is required to give a firm base to the bank. The furrow drains are cleaned out every year, and the spoil added to the bank, raising it by about 20 cm. annually. The furrows are roughly 20 m. apart, and the vertical interval 4 m. The system lends itself to the formation of small fields suited to peasant farming and to colonization of broken country which otherwise could not be settled on account of erosion.—R.N.

[1330] 631.622

THERON, J. J. **Lysimeter experiments.** *S. Africa Dept. Agric. Sci. Bull.* 288, pp. 41. [Agric. Res. Inst., Pretoria]

Percolation for 15 years through a regularly cultivated fallow soil was 0.7-20.5% of the rainfall. Percolation was very irregular in soils cropped annually with maize; in soils receiving mineral fertilizers it was 3.1% and where manure also was used it was 2.2%. Owing to the high rate of transpiration and evaporation in the summer-rainfall areas, leaching took place only during periods when crops did not grow actively. Runoff from soils with similar surfaces to those of the cropped lysimeters was 20% of the rainfall. On fallow soil on which no run-off was allowed to take place, not more than 25% of the rainfall seeped down to underground-water supplies. Under grass 5.17, 4.05 and 2.06% of the rainfall percolated to 2, 3 and 4 feet, respectively.

The percolate from cultivated and cropped soils consists of a solution of Ca and Mg nitrates. Loss of nitrate from the fallow soil was 350 lb./acre annually and from cropped soil 75 lb./acre. During the last 5 years both the amount and the concentration of minerals contained in the percolate from cultivated soil have declined and it seems that the reactions in the soils are gradually approaching equilibrium.

N is lost from the soil not only by leaching and absorption by plants, but also by volatilization. It is estimated that 1322

lb./acre of N was lost from the fallow soil and 1000 lb. from the cropped soil in the 15 years. The volatilization apparently takes place only during the first few years while organic matter decomposes rapidly. The percolate from lysimeters under grass had low nitrate and relatively high $NaHCO_3$ and $KHCO_3$ content.

[1331] 631.67 : 551.57
PEIKERT, F. W.; TRIBBLE, R. T. **The effect of irrigation on the humidity in orchards.** *Mich. Agric. Expt. Sta. Quart. Bull.* 31, 1949 (266-269).
Experiments to discover whether certain fungus diseases were encouraged by the high humidity induced by sprinkler irrigation in orchards were carried out in an apple orchard. The results appeared to indicate that any increase in humidity was confined within the approximate area covered by the sprinklers and that the humidity in the irrigated zone returned to approximately normal within an hour after irrigation.

[1332] 631.67 : 631.58
RECHENTHIN, C. A. **Maintaining the productivity of irrigated lands.** *Better Crops* 33, 1949 (15-18, 45-48).
A survey of the information available at experiment stations on irrigation practices for the maintenance of soil fertility.

[1333] 631.671 : 631.414.324 : 631.415.1
ASHGAR, A. G.; DHAWAN, C. L. **Quality of irrigation water. Effect of pH value and exchangeable bases of soils.** *J. Indian Chem. Soc.* 25, 1948 (179-184). C.A. 43 (2351).
Irrigation of soil plots or leaching of soil samples with water containing 10-60 parts per 100,000 of Na_2CO_3, $NaHCO_3$, NaCl or Na_2SO_4 caused increases in pH and degree of alkalization. Of the Na salts tested, the effect of $NaHCO_3$ was the most marked and it also caused significant increases in the total salts of the soil. Leaching soils with solutions of various salt indexes [salt index—(total Na—24.5)—(total Ca—Ca in $CaCO_3 \times 4.85$)] showed that while solutions with positive indexes decreased pH, degree of alkalization and total salts, these constants were increased by solutions with negative indexes. Irrigation with waters containing Na salts within permissible limits will apparently still cause gradual deterioration of the soil, and waters with negative salt indexes can be used for reclamation of high-salt soils.

631.8 FERTILIZERS

(*See also* Abs. No. 1423)

[1334] 631.81
SIEMS, H. B. **The fertilizer phase.** *Proc. Natl. Joint Cttee. Fert. Appl.* 23, 1947 (15-18). [Swift and Co., Chicago]
Points to be considered in the manufacture and application of fertilizers are discussed with reference to chemical composition, physical properties, nutrient balance and availability of various sources of plant nutrients.

[1335] 631.81
MAANDBLAD VOOR DE LANDBOUWVOORLICHTINGSDIENST. Samenstelling van meststoffen. **[Composition of fertilizers.]** *Maandbl. LandbVoorlD.* 6, 1949 (35-37).
Tables of composition.

[1336] 631.81(083.72)
MAANDBLAD VOOR DE LANDBOUWVOORLICHTINGSDIENST. Afkortingen van de namen van meststoffen. **[Abbreviations of fertilizer names.]** *Maandbl. LandbVoorlD.* 6, 1949 (35).

[1337] 631.81 : 539.16
GERICKE, S. Düngungsversuche mit Plantoradon. **[Fertilizer experiments with Plantoradon.]** *Z. PflErnähr. Düng.* 42, 1948 (39-41). [G.]
Plantoradon (a source of radioactive material of unstated composition), recommended at rates equivalent to 2 dz./ha. for supplementing ordinary fertilizers, was tested in pot experiments on lettuce followed by red clover (one cut) in fourfold replication. Nitrophoska was used at rates of 3-20 g. per pot and Plantoradon at 1.5-10 g. per pot. Generally, Plantoradon was ineffective in increasing yields above those given by Nitrophoska alone, and at higher rates there was a depression. Observed increases of 2.6% in favour of Plantoradon are of no practical importance.—K.S.

[1338] 631.81 : 545
MARTENS, P. H. Notes résumées sur l'évolution de l'analyse des engrais. I. **[A resumé of the development of fertilizer analysis. I.]** *Ann. Gembloux* 55, 1949 (1-27). [F.] [Inst. Agron., Gembloux]
The methods discussed include those for ammoniacal, nitric and organic N, mixtures

of different forms of N and the preparation of the solutions for analysis of total, water-soluble, ammonium-citrate-soluble, 2%-citric-acid-soluble and free phosphoric acid.

[1339] 631.81 : 551.481
CHIMITS, P. Sur une méthode rationelle d'épandage d'engrais dans les étangs. **[The rational fertilizing of ponds.]** *C.R. Acad. Agric.* 35, 1949 (164-168). [F.]

Ponds require liming not according to their pH, but according to their hydrotimetric level, 1° of which corresponds in principle to a CaO content of 5.7 mg./l. The pond, if its hydrotimetric level is below 15, should be brought to this level by the addition, before March, of a calculated amount of lime or chalk. Two or 3 weeks later, 150-200 kg./ha. of P fertilizer (basic slag if the level is below 15, super. if it is above) should be added. K fertilizer at 30 kg./ha. may be added only to deep calcareous water poor in plant life. Nitrates may be used, if at all, only at the end of June at 30 kg./ha. on ponds recently stocked. Organic N, especially farmyard manure, well distributed at 1 ton/ha. in June, has an excellent effect on newly stocked ponds.

[1340] 631.81 : 631.416
EHRENBERG, P. Über Düngungsmassnahmen in Verbindung mit Bodenuntersuchungen. **[Manurial practice in conjunction with soil testing.]** *Z. PflErnähr. Düng.* 40, 1948 (129-134). [G.] [Weihenstephan]

It is not always economic to manure soils which are poor in nutrients, since several other factors may limit crop response. Experimental results over 12-16 years indicate that in times of fertilizer shortage it may be better to restrict fertilizer application to soils of higher fertility where other growth factors also are favourable, than to manure crops on very deficient soils.—K.S.

[1341] 631.81 : 631.42
EWERT, R. Höhere Erträge durch planvollere Anwendung künstlicher Düngemittel. **[Higher yields through more systematic artificial fertilizing.]** *Z. PflErnähr. Düng.* 38, 1947 (65-73). [G.]

It is urged that, for the most productive utilization of fertilizer and experimental resources, all future soil-nutrient and fertilizer investigations should include special consideration of the state of the soils in question with respect to the main factors affecting the utilization of applied fertilizer—such as the humus content, structure, subsoil conditions, profile conditions, such as the presence of compacted layers, and texture. This would form a general frame of reference facilitating direct evaluation of the effect of a treatment and comparison of the effect on a given soil with that on a local or distant or different type of soil.

[1342] 631.81 : 631.557
MITSCHERLICH, E. A. Das Ergebnis von über 27,000 Felddüngungsversuchen. **[The result of over 27,000 field fertilizer experiments.]** *Z. PflErnähr. Düng.* 38, 1947 (22-35). [G.]

In about 7,000 experiments with P, 9,900 with K and 10,000 with N the means of the recorded yields of cereals, roots and hay for the various levels of fertilizing agreed closely with the yields as calculated by the use of the Mitscherlich equation. The results indicate that mean crop yields could be increased by 20-49% with suitable P fertilizing and by a further 14-30% with suitable K fertilizing. The results for N indicate also that actual yields are very much below the maximum possible from a full use of N, largely because of the danger of scorching and lodging when high rates of N are used. The urgent need of an organic manure which would, throughout the plant-growing period, produce quantities of nitrate N is stressed, as also the value of green manuring for this purpose. Yields of the root crops could be increased by 75% by such a suitable N fertilizing.

[1343] 631.81 : 631.577
GERICKE, S. Die mineralischen Nährstoffe als Grundlage einer Leistungssteigerung in der deutschen Landwirtschaft. **[Mineral nutrients as a basis for increasing yields in German agriculture.]** *Z. PflErnähr. Düng.* 41, 1948 (64-76). [G.]

Results of about 27,000 field trials over 10 years show that 1 kg. of N produces 17.4 kg. of grain, 90 kg. of potatoes, 87 kg. of sugar beet, 200 kg. of mangolds, 22 kg. of meadow hay (2 cuts). 1 kg. of P_2O_5 produces 6.2 kg. of grain, 46 kg. of potatoes, 51 kg. of sugar beet, 125 kg. of mangolds, 26.3 kg.

of meadow hay. 1 kg. of K_2O produces 2.7 kg. of grain, 19 kg. of potatoes, 29 kg. of sugar beet, 68 kg. of mangolds and 12.4 kg. of hay. A survey of fertilizer efficiency by districts shows that increases above the average were obtained from N in north Germany, from P_2O_5 in mid Germany and the north, and from K_2O in the north and south. Values below the average were obtained from all nutrients in Silesia and, except for P_2O_5 in mid Germany. P_2O_5 was comparatively ineffective in the west, due partly to climate and partly to soil acidity.

Comparison of the results of the 27,000 experiments with statistics of average yields in Germany before the war, indicates the possibility of a 30% increase in crop yields. Compared with yields in the post-war years, production could be raised by 50%; this is particularly true of root crops with their high response to fertilizers.—K.S.

631.811 PLANT NUTRITION

(*See also* Abs. Nos. 1174, 1212, 1432, 1448)

[1344] 631.811
MITSCHERLICH, E. A. Ein Beitrag zur Phosphorsäure- und Kali-Aufnahme der Pflanzen. **[Phosphate and potash uptake by plants.]** *Z. PflErnähr. Düng.* 41, 1948 (193-201). [G.] [Berlin]

The author applies his growth-factor efficiency law to the results of some 650 pot experiments on 3 soil types with 6 levels of P, and to the results of over 1600 similar experiments with K. Contrary to general belief that crops utilize nutrients differently, it is shown that under the same growth conditions all plants absorb the same amounts of P_2O_5 and K_2O and utilize them for production until the soil is exhausted. The amounts of nutrients absorbed by the plants increase with the amounts available to them, and as long as increased yields are produced by suitable manuring, about 50% of the P and about 80% of the K present in the soil will be absorbed by the plants.

Data of lower P uptake, notably by flax, cited by Opitz, are explained by Mitscherlich on the basis that the P in Opitz's experiments was fixed by added lime.—K.S.

[1345] 631.811 : 539.16
SAUCHELLI, V. **Radioisotopes in agricultural research.** *Proc. Natl. Joint Cttee. Fert. Appl.* 23, 1947 (35-41). [Davison Chem. Corp.]

[1346] 631.811 : 539.16
PARKER, F. W. **Future development of the radio-active research program.** *Amer. Fert.* 110, No. 3, 1949 (9-10, 20-22). [Bur. Pl. Indust., Beltsville, Md.]

Work will be directed to the development of procedures for the safe and effective use of radioactive Ca and S, involving a study of their movement in the soil, possible contamination of drainage water, absorption by plants and possible methods of blanketing or minimizing the radioactivity. Other development work will relate to procedures for the use of minor elements—Cu, Zn, Mo and Fe in soil and plant-nutrition investigations. Isotopic techniques also offer a promising method of advancing our knowledge of the chemistry of K in soil colloids.

[1347] 631.811 : 631.414.3
SCHUFFELEN, A. C. Plantengroei, ionenabsorptie en ionenverhouding. **[Plant nutrition, ion absorption and ion relationship.]** *Agricultura* 46, 1948 (1-22). [Du.f.] [Wageningen Agric. Coll.]

An attempt was made to analyse the factors causing "Hooghalen" (Mg-deficiency) disease by ion-absorption experiments performed on excised roots of oat seedlings and to deduce a theory of plant nutrition. Two processes are postulated, namely (1) the transport of ions through the plant root, i.e., by living matter, which is governed by temperature and oxygen pressure—the 'pump function'—and (2) the transference of ions from dead to living material depending on the ion activity of the medium and of the plant—the 'wall function'.

An analysis of the wall function, i.e., of the ion adsorption by the root wall, shows that this adsorption is chiefly determined not by the ion concentration of the medium, but by the relative ion concentration which regulates the offer of ions to the roots.—K.S.

[1348] 631.811.1 : 546.56
MOSOLOV, I. V. **[Some peculiarities of nitrogen metabolism in plants in copper-deficient soils.]** *Dokl. Akad. S.-Kh. Nauk* No. 6, 1948 (32-36). [R.]

Physiological. Copper deficiency produces a predominance of synthetic over hydrolytic processes, as a consequence of which there is an excess of protein N and a deficiency of non-protein N in the leaves at the end of the vegetative period.

[1349] 631.811.2
MICHAEL, G. Untersuchungen über die Stoffaufnahme der höheren Pflanzen. I. Über die Aufnahme schwer löslicher Phosphorsäure durch die Pflanzen. **[Nutrient uptake in higher plants. I. The uptake of difficultly soluble phosphorus.]** *Z. PflErnähr. Düng.* 39, 1947 (193-202). [G.]

A review of the results of experiments with ground rock phosphate, illustrating the effect on P solubility of soil reaction, Ca and the position of the source of P in relation to the zone of rooting. The physiological factors involved, including the rate of root growth, have much more effect on the uptake of difficultly soluble P than on that of more soluble nutrients.

[1350] 631.811.2 : 539.16
SPINKS, J. W. T. **Use of radioactive tracers in chemistry of plant nutrition.** *Chem. Inst. Canada Proc. Conf. Nuclear Chem.* 1947 (134-152). B.A.AIII, 1949 (203).

In the early stages of growth, 80% of the P used by growing wheat came from radioactive P fertilizer; the proportion decreased rapidly as the plant grew older. Plants receiving fertilizer took up more from the soil than did those grown on untreated soil.

[1351] 631.811.2 : 539.16
AMERICAN FERTILIZER. **Radioactive fertilizers discussed at Industry meeting.** *Amer. Fert.* 110, No. 3, 1949 (7-8, 28).

Results of experiments with radioactive isotopes of P in fertilizer-placement studies are discussed.

Experiments at Beltsville showed no improvement in the quantity or quality of crops from the use of the radioactive fertilizer over that of the ordinary type of plant food.

[1352] 631.811.2 : 581.192
ZUEV, L. A. **[The effect of different levels of phosphate nutrition on the development of young plants.]** *Pochvovedenie* 1949 (157-160). [R.]

The effect of different levels of P on various fractions of organic P in the plant. A fairly close correlation was established between the content of citric-soluble phosphate in the soil and the absorption of P by young plants.

[1353] 631.811.2 : 631.416.313 : 631.416.322
SCHARRER, K.; SCHREIBER, R. Weitere Untersuchungen über den Einfluss von Chlor- und Sulfat-Ionen auf die Aufnehmbarkeit des Phosphat-Ions durch Keimpflanzen. **[Further studies of the influence of chloride and sulphate ions on the assimilability of phosphate ions in seedlings.]** *Z. PflErnähr. Düng.* 39, 1947 (218-226). [G.]

In experiments using P, SO_4 and Cl at rates far exceeding those of farming practice, P uptake of seedlings in 9 and 18 days, especially in light and medium soils, was much depressed by applications of SO_4 as Na_2SO_4 and especially of Cl as NaCl.

[1354] 631.811.4
GOY, S. Welche Kalkgaben sind die zweckmässigsten? **[Which lime dressings are most economical?]** *Z. PflErnähr. Düng.* 40, 1948 (97-101). [G.] [Leipzig]

The author discusses Lemmermann's results of 24 years' experiments with varying levels of lime (Ibid. 38, 1947, p. 89) which indicates that repeated small dressings of lime are more effective than single large dressings on light sandy soils of nearly neutral reaction. He concludes: the greater the buffer value and therefore the base-adsorbing surface of a soil the lower may be the pH value without adversely affecting yields. If soil is poorly buffered the pH value must be higher to indicate sufficient base (or lime) content.

In judging soils on lime requirement it is advisable to take into account buffer value and degree of dispersion or to find a new test, since well buffered soils with a low pH value may appear as badly buffered.—K.S.

[1355] 631.811.5

DORPH-PETERSEN, K.; STEENBJERG, F. Forsøg med natriumhaldige Gødninger. **[Experiments with sodium-containing fertilizers.]** *Tidsskr. Planteavl* 52, 1949 (484-519). [Da.e.]

Some 400 trials with application of agricultural salt to sugar beet during 1914-18 showed beneficial effects of the salt. Na is not, however, an essential plant nutrient. Results from pot-culture work demonstrated the nutritional value of Na for certain plants, and led to the conclusion that the plant-physiological function of Na is of a similar nature to that of K which it can, at least in part, replace. The amount of Na necessary to produce the same increases in yields under field conditions as a given application of K is 2-3 times the chemical equivalence. A few other crops besides sugar beet were found to respond to agricultural salt, but some crops with high K requirements, such as potatoes and lucerne, did not. In field trials comparisons of Na and Ca applied to sugar beet in combination with N were made. The small superiority of $NaNO_3$ over $Ca(NO_3)_2$ could be balanced by addition of salt to the latter. The effect of $NaNO_3$ is closely related to the K status of the soil. It is recommended to limit the use of agricultural salt to sugar-beet crops, for which an increase of 100-200 kg./ha. of dry matter can be expected from 100 kg. of salt. K fertilizers are, however, to be preferred in view of their residual value to subsequent crops.—S.G.H.

[1356] 631.811.9

BEAR, F. E. **Soil fertility in relation to fertilizer practice.** *Proc. Natl. Joint Cttee. Fert. Appl.* 23, 1947 (12-15).

As the intensity of New Jersey agriculture has been stepped up by methods which include the increased use of lime and fertilizers, the limiting factors in production have become the development of minor-element deficiencies and deterioration in the physical properties of soils. It is now believed that all fertilizers should carry, per ton, at least 5 lb. of borax, 100 lb. of borax for high-B crops, and 40 lb. of available Mg for acid-soil crops. If application of lime raises the soil pH above 6.5, Mn deficiencies come into play. The peat soils require Cu at rates up to 50 lb./acre, and possibly Zn. Physical deterioration has set in with the depletion of organic residues from the original forest and has increased with more intensive use of heavier cultivating machinery.

[1357] 631.811.9 : 539.16

WOODRUFF, N. H. **Radioisotopes for fertilizer research.** *Proc. Natl. Joint Cttee Fert. Appl.* 23, 1947 (21-34).

Methods of making radio-isotopes by use of the chain-reacting pile are outlined.

[1358] 631.811.9 : 546.27

BOTTINI, E. I microelementi dei terreni agrari. Nota I.—Il boro nella vita vegetale. **[Trace elements of soil. I.—Boron and plant life.]** *Ann. Ist. Sper. Chim. Agrar. Torino* 16, 1946-1948 (359-386). [I.]

The chemistry of B in minerals and plants is reviewed.—R.N.

[1359] 631.811.9 : 546.77

MILLIKAN, C. R. **Antagonism between molybdenum and certain heavy metals in plant nutrition.** *Nature* 161, 1948 (528). [Pl. Res. Lab., Burnley, Victoria, Australia]

Water-culture experiments with flax, peas, cabbages and tomatoes have shown that the severity of Fe-deficiency symptoms caused by excess of Mn, Zn, Cu, Co or Ni may be reduced by increasing the supply of Mo up to 20 p.p.m. On highly-acid soils in Victoria, "lower leaf scorch" has been aggravated by S, steam sterilization or $MnSO_4$ and prevented by liming and by applying 1-2 lb./acre of ammonium molybdate.

[1360] 631.811.91

DRAGHETTI, A. I sistemi d'irrigazione con particolare riguardo alle terre argillose. **[Irrigation systems with special reference to heavy soils.]** *Ital. Agric.* 86, 1949 (213-219). [I.]

Semi-popular presentation of the magnitude of water demands by plants for growth and transpiration followed by a brief consideration of modes, amounts and timings of irrigation. Tables summarize the results of several hundreds of tests of Emilian soils.—R.N.

[1361] 631.812

INTERNATIONAL SUGAR JOURNAL. **Prevention of caking of fertilizers.** *Int. Sug. J.* 51, 1949 (147).

Serious caking of compound fertilizers can be prevented by the addition of 3% of sawdust or peat during mixing.

[1362] 631.812 : 539.215
ELECTRICAL REVIEW. **Fertilizer granulation.** *Elect. Rev. Lond.* 143, 1948 (813-817). B.A.BIII, 1949 (105).

A modern plant process, consisting of preparation of the raw materials, granulation by water-spraying of the powder, drying of the granules, grading and packing is described.

631.816.3 FERTILIZER PLACEMENT

[1363] 631.816.3 : 633.491
COOKE, G. W. **Apparatus for fertilizer placement field work.** *Chem. Indust.* April 23, 1949 (271). [Rothamsted]

Commercial drills designed to place fertilizer beside the seed are likely to be satisfactory only if suitable free-flowing fertilizers are used. Fertilizer broadcast on the flat to potatoes before ridging was inefficient and gave lower yields than the same quantity broadcast over the ridges before planting. Where potatoes were planted in furrows and the ridges split to cover the seed, there was no advantage in placement methods; fertilizer should be broadcast over the ridges before planting. Where potatoes were planted by machines which worked on the flat by opening a furrow, planting the seed and closing the furrow in one operation, the broadcast fertilizer should be applied on the flat before the machine starts work.

[1364] 631.816.32
VOLK, N. J. **Problems connected with subsoil placement of fertilizers.** *Proc. Natl. Joint Cttee. Fert. Appl.* 23, 1947 (78-86). [Purdue Univ.]

From a review of the most recent work it is conluded that subsoil placement of fertilizer paid best when the subsoil was well drained and well aerated, but methods of subsoil improvement present a problem. Results are also dependent on the crop, deep-rooting types benefiting most. The application of fertilizer in narrow bands in the subsoil without mixing may not be beneficial in heavy soils, but for light-textured soils, mixing of fertilizer and soil is apparently unnecessary. More work is required on how the fertilizer should be applied and on the type of machine required.

[1365] 631.816.32
STEWART, A. B. **Manuring and crop production with special reference to fertilizer placement.** *Chem. Indust.* April 23, 1949 (271). [Macaulay Inst., Aberdeen]

With cereals, P fertilizers are twice as effective when combine-drilled with seed as when broadcast. There is almost no difference between broadcasting and combine-drilling inorganic N fertilizers at ordinary rates of application. Combine-drilling of N at rates greater than the equivalent of $1\frac{1}{2}$ cwt. of $(NH_4)_2SO_4$ or 2 cwt. of nitro chalk per acre is not recommended because of possible damage to germination and early development, particularly on light soils in dry seasons. On thin, K-deficient chalk soils in S. England combine-drilling of K fertilizers frequently gives spectacular beneficial results. In Scotland there has been little difference between combine-drilling and broadcasting quantities up to 1 cwt./acre of 60% KCl. With 40% salts there is more risk of injury in combine-drilling.

On land being reseeded to grass, beneficial effects of combine-drilling P are similar to those obtained with cereals; with N and K fertilizers broadcasting is superior to combine-drilling. Preliminary experiments indicate that contact placement of fertilizer with the seed of turnips and swedes is dangerous and that band placement of P near to but not in contact with the seed is safe. The placement of P fertilizers slightly below and to the side of drilled cereals markedly reduces lodging and advances ripening by several days. Placement of "starter" fertilizer solutions has no advantage over the use of dry fertilizers.

[1366] 631.816.32
STEWART, A. B. **Fertilizer placement for arable crops.** *Dept. Agric. Scotland Leafl.* 3 (n.s.) 1949, pp. 12.

A survey of the experimental evidence available in Britain.

[1367] 631.816.35
STEWARD, F. G. **Special fertilizer placement problems under irrigation conditions.** *Proc. Natl. Joint Cttee. Fert. Appl.* 23, 1947 (86-91). [Shell Chem. Corp., San Francisco, Calif.]

Methods of irrigation and fertilizer placement used in the West are briefly summarized. Problems arising from the application of

fertilizers in solution form include corrosion of equipment and possible precipitation of insoluble salts. Although the practice is usually feasible and economical, under certain conditions it is not advisable, e.g., in rice fields where the water flows in through a headgate. The most common high-unit plant foods used are anhydrous NH_3 and NH_4 salts. Corrosive action has prevented the use of liquid phosphoric acid, while H_2SO_4 must be very much diluted by introducing it into a good flow of water. Precipitation of Ca salts by NH_3 can be prevented by the use of small amounts of Na hexametaphosphate. Controlled metering is important.

631.82 MINERAL AMENDMENTS LIME

(*See also* Abs. No. 1188)

[1368] 631.821 : 631.879.1
EHRENBERG, P.; BUCHNER, A. Die Verwendung von Städte-Trümmerschutt zur Kalkdüngung landwirtschaftlicher Nutzpflanzen. **[The use of town rubble for liming crops.]** *Z. PflErnähr. Düng.* 42, 1948 (20-30). [G.] [München]

Town rubble claimed to be a useful liming material consists of 30% of flint and brick fragments, glass and unburnt wood splinters and about 70% of fine rubble passing a 1-mm. sieve. Ca content varies; the sample used in the pot experiments described contained 27.9% CaO as compared with 54.47% in commercial ground limestone. The material was tested on different soils using birdsfoot trefoil, Welsh rye grass and sugar beet as test plants. There was in general no difference shown between the materials; the case of apparent superiority of the rubble may have been due to an adverse effect of the very fine particles in the commercial liming material on lime-sensitive plants. —K.S.

[1369] 631.822
ARLAND, A. Flussschlamm als Düngemittel. **[River mud as a fertilizer.]** *Deut. Landw.* 1, 1947 (70-72). [G.]

River mud applied at 250 and 750 dz./ha. increased crop yields by 32 and 80% respectively, having a good effect on the growth even of sensitive crops such as garden beans and spinach. The root-soluble K and P_2O_5 contents (Neubauer) were 57 and 8.6 mg. respectively.

[1370] 631.822
MANSHARD, E. Verwendung von Elbschlick als Bodenverbesserungsmittel. **[Use of Elbe silt as a soil improver.]** *Z. PflErnähr. Düng.* 40, 1948 (61-77). [G.] [Hamburg]

Chemical and mechanical analyses are reported for samples of silt from Harburg and Hamburg. The material is intended for use on poor sandy soils; it must be stored for several months to destroy toxic substances and to initiate nitrification. Neubauer tests on barley showed that the silt is deficient in P_2O_5 and K_2O. The manurial value is not increased by admixture with peat, but the peat may be useful for absorbing excess moisture.—K.S.

[1371] 631.822
MIDDLETON, A. C. **Clay marling: some historical notes.** *Agriculture* 56, 1949 (80-84).

[1372] 631.824
MACINTIRE, W. H.; WINTERBERG, S. H.; STERGES, A. J. ET AL. **A comparison of olivine, serpentine, magnesite, dolomite, and selectively calcined dolomite as sources of magnesium for red clover.** *Soil Sci.* 67, 1949 (287-297). [Univ. Tenn. Agric. Expt. Sta.]

Incorporation of the Mg-silicate minerals (a) serpentine and (b) forsterite olivine were compared with those of equivalent inputs with and without super. of (c) limestone, (d) calcite, (e) wollastonite, (f) dolomite, (g) selectively calcined dolomite and (h) corresponding mixtures of $CaCO_3$ and MgO, as sources of nutrient Mg for red clover on acid soils in greenhouse pots. In conjunction with 80-lb. inputs of P_2O_5, (c), (d) and (e) promoted plant response and raised soil pH values; (f), (g) and (h) were effective sources of nutrient Mg and corrected soil acidity. The silicate minerals, when used at economic rates, were not effective sources of nutrient Mg and did not appreciably change soil pH values, but can be used as Mg fertilizers when used to engender di-Mg-phosphate in their mixtures with super. of adequate moisture content.

[1373] 631.828 : 546.56

STEENBJERG, F.; BOKEN, E. Kobber i Jord og Kulturplanter III. Kobberinhold og Kobbermangel i jydske Jordtyper. **[Copper in soils and crops III. Copper content and copper deficiency in Jutland soil types.]** *Tidsskr. Planteavl* 52, 1949 (375-459). [Da.e.]

No less than 2245 surface and 595 subsoil samples have been analysed to form a basis for judging the Cu problem of the vast areas of light soils covering most of Jutland. Available Cu is expressed as the amount of Cu extracted from a soil by HCl to give a pH of 2.0 in the filtrate. Soils high in organic matter, i.e., peat moors or sandy peat moors, are consistently lower in available Cu than similar soils with low humus content. Increases in available Cu and in yields after Cu application to such soils are small, the added Cu being held in an unavailable form.

In 640 field trials in 1925-44 with Cu fertilizers the average increase for 50 kg. of $CuSO_4$ per ha. was 400 fodder units. Field trials have justified the use of cheaper Cu fertilizers such as copper pyrites or malachite instead of copper sulphate. Results of 18 field trials with 50 kg. of $CuSO_4$/ha. to test the residual value of added Cu gave over three years average yield increases of 226, 275 and 217 fodder units respectively. In 40 other experiments the first-year increase averaged 315 and the second-year 260 fodder units.—S.G.H.

631.83 POTASSIUM FERTILIZERS

(*See also* Abs. Nos. 1189, 1433, 1495)

[1374] 631.831

MARX. Holzasche ein Kaliphosphatdünger. **[Wood ash, a potassium and phosphorus fertilizer.]** *Deut. Landw.* 1, 1947 (87-88). [G.] Z.P.D. 39, 1947 (287). [G.]

The K_2O, P_2O_5 and CaO contents of the ashes of various trees and herbaceous plants are tabulated. To counteract a soil deficiency in all 3 nutrients, applications of up to 10 dz./ha. are required.

631.84 NITROGEN FERTILIZERS

(*See also* Abs. Nos. 1436, 1437)

[1375] 631.84

JOURNAL OF SCIENTIFIC AND INDUSTRIAL RESEARCH (INDIA). **Production and use of ammonium sulphate.** *J. Sci. Indust. Res. India* 7, 1948 (239-240).

Quoting from *Chem. Age* 58, 1948 (52), data published by the Sulphate of Ammonia Federation Ltd. show the production and consumption of fixed-nitrogen fertilizers by countries and continents for the years 1946-47 and 1938-39.

[1376] 631.841/2 : 631.433.2

HENDE, A. VAN DEN; BOCKSTAELE, L. De werking van nitrische en ammoniakale stikstofmeststoffen op vroeger overstroomde gronden. **[The effect of nitrate and ammoniacal fertilizers on previously flooded land.]** *Meded. LandbHoogesch. Opzoekingssta. Gent* 13, 1948 (253-259). [Fl.g.]

The land received NPK in 1943, 650 kg. of super. in 1944, was sown to peas, and was inundated with slightly brackish water in April/October, 1944 (soil Cl about 0.017%). In April, 1945, it was treated with lime and gypsum (pH 7.6), divided into 3 sections, ploughed (1) to 5 cm. depth, (2) to 12 cm. and (3) to 18 cm. depth, and sub-divided into plots for differential nitrogen treatment. Fodder beet was sown in May. Maximum yields (up to 87 kg. of roots/ha.) were obtained on plots ploughed to 5 cm. depth and receiving 400 kg. N/ha. as nitrate; comparable sulphate-of-ammonia plots yielded 84 kg/ha.; controls about 50 kg./ha. Rather lower yields are recorded on plots ploughed to 12 and 18 cm. depths. Superiority is claimed for the nitrate form; nitrification of the ammonia may have been incomplete in this soil.

In the absence of statistical treatment, yield differences between N forms and ploughing depths appear of doubtful significance. —K.S.

[1377] 631.841 : 631.812

INDUSTRIAL CHEMIST. **Fertiliser from coke-oven gas. II.** *Industr. Chem.* 24, 1948 (729-736). B.A.BIII, 1949 (57).

A unit in which H and N are isolated and converted into NH_3 is described.

[1378] 631.841.1 : 631.812
INDUSTRIAL CHEMIST. **Fertiliser from coke-oven gas. I.** *Industr. Chem.* 24, 1948 (657-665). B.A.BIII, 1949 (4).

The production of $(NH_4)_2SO_4$ from coke-oven gas and SO_3, derived from a form of Spanish pyrites, by Nitrogen Fertilisers Ltd. is described.

[1379] 631.841.5 : 631.816.2
IVERSEN, K.; DORPH-PETERSEN, K. Forsøg med forskellige Udførselstider for Kalkkvaelstof. 1944-1947. **[Experiments with different times of application of cyanamide. 1944-1947.]** *Tidsskr. Planteavl* 52, 1949 (520-538). [Da.]

Previous work showed that cyanamide gave considerably lower yields compared with nitrate of soda, nitrochalk and sulphate of ammonia. Field trials show that the effect from cyanamide is greatest for early application to all crops, and when harrowed in immediately after application in the case of root crops. In some cases a certain amount of damage was observed with cereals. The overall effect was considerably less than from the commoner nitrogenous fertilizers. —S.G.H.

[1380] 631.841.7 : 631.461.1/3
FULLER, W. H.; CLARK, K. G. **Microbiological studies of urea-formaldehyde preparations.** *Proc. Soil Sci. Soc. Amer. 1947*, 12, 1948 (198-202). [Beltsville, Md.]

Urea-formaldehyde preparations have recently been recognized as useful sources of slowly available N when they are used as fertilizers. An attempt has been made to assess the influences of soil micro-organisms on the rate of release of available N from such preparations.

The amount of carbon dioxide evolved has been assumed to indicate the availability of soil organic matter and the degree of activity of the microflora. By this criterion, the presence of 1% of urea-formaldehyde in soil promoted microbial activity; nitrification also took place satisfactorily. It is shown that soil micro-organisms are essential for making the N of the compounds available to plants, and that chemical hydrolysis plays only a minor part. The proportion of the urea to formaldehyde affects the solubility of the final product and also the rate at which its N can be utilized; a molecular ratio between 1.2 and 1.4 gives the most satisfactory results.—L.M.C.

[1381] 631.841.8
ANDREWS, W. B. **The use of anhydrous ammonia as a source of nitrogen.** *Proc. Natl. Joint Cttee. Fert. Appl.* 23, 1947 (68-77). [Miss. Agric. Expt. Sta.]

Results of three years' experimental work on the use of anhydrous NH_3 for crop production are summarized with reference to costs, properties, application, crop response, equipment and the choice between aqua- and anhydrous NH_3.

[1382] 631.841.8
SAWYER, F. **How green is our valley.** *Chem. Engng. News* 26, 1948 (3258-3259).

When applied to the soil as a solution in irrigation water, anhydrous NH_3 may cause precipitation of $CaCO_3$ which would restrict flow in irrigation pipes. This may be prevented by the addition of Na hexametaphosphate solution. One effect of fertilizing with anhydrous NH_3 is to increase the earthworm population. Effects on plant growth and methods of application are also described.

[1383] 631.841.8 : 631.816.3
LEAVITT, F. H. **Nitrogation, nitrojection and soil fumigation.** *Amer. Fert.* 110, No. 2, 1949 (7-8, 24-25). [Agric. Dept., Shell Chem. Fed., San Francisco]

"Nitrogation" means the distribution of anhydrous ammonia as a fertilizer in irrigation water. "Nitrojection" is the direct injection of anhydrous ammonia without the use of irrigation water. The method of delivery of anhydrous ammonia to farms and the equipment necessary for this operation and for nitrogation and nitrojection are described. Nitrojection equipment can easily be converted for soil fumigation.

[1384] 631.842.3 : 631.811.9
SCHMALFUSS, K. Über Versuche zur Spurenelementwirkung des Chilesalpeters in Zylinderversuchen aus den Jahren 1937 und 1938. **[Experiments on the trace-element effect of Chile nitrate in pot experiments in 1937 and 1938.]** *Z. PflErnähr. Düng.* 40, 1948 (35-39). [G.]

Chile nitrate carrying 19,200γ of iodine and 136,600γ of boron per 100 g. was compared with synthetic sodium nitrate on cereals in soil from Dahlem plots. No differences in treatment attributable to trace-element content was shown in yield, 1000-

corn weight or grain/straw ratio. More boron and considerably more iodine were absorbed by the cereals in the Chile-nitrate pots.—K.S.

[1385] 631.847.2

MARCILLA ARRAZOLA J.; AGUIRRE ANDRES, J.; XANDRI TAGÜEÑA, J. M. Inoculación de las semillas de leguminosas con bacterias radicicolas. Experiencias sobre inoculación de garbanzos con preparados comerciales de *Rhizobium cicerii.* [**Legume seed inoculation with root bacteria. Experiments on the inoculation of chickpea with commercial preparations of *Rhizobium cicerii.***] *Bol. Inst. Investig. Agron. Madrid* No. 19, 1948 (1-75). [Sp.e.f.]

In open-field plots in regions where chickpea had been traditionally grown, the plants from seed inoculated or un-inoculated with *Rhizobium* from a commercial preparation, and treated or untreated with $CuSO_4$ fungicide, were investigated for dry matter and N content of roots, shoots, fruits and nodules and number of nodules/plant. It is concluded provisionally that disinfection results in better germination and growth, but that inoculation was clearly beneficial only in one district. The need is stressed to establish first of all, and probably for each type of legume, the superiority of the *Rhizobium* to be used over the strains native to the area.

[1386] 631.847.2 : 631.461.51

SCHMIDT, O. C. Zur Frage der Impfung mit Azotobacter. I. [**Azotobacter inoculation. I.**] *Z. PflErnähr. Düng.* 40, 1948 (40-54). [G.]

A survey of the literature, mainly Russian. Data are contradictory, and successful results are generally lacking on German soils. Systematic experiments are now in progress at Berlin University.—K.S.

631.85 PHOSPHATE FERTILIZERS

(*See also* Abs. No. 1349)

[1387] 631.85

GERICKE, S. Phosphorsäure-Düngungsfragen. [**Phosphate manuring problems.**] *Z. PflErnähr. Düng.* 40, 1948 (237-268). [G.] [Berlin-Dahlem]

A survey of the results of 20 years' German work on phosphatic fertilizers. In the 1914/18 war German consumption of P_2O_5 averaged 12.7 kg./ha. per annum, falling to 6.7 in the 2 post-war years; in the 1939/45 war consumption averaged 11.1 and in the 2 post-war years 5.1 kg./ha. The P_2O_5 balance of German soils has been negative for 70 years; the recovery of added P_2O_5 is put at 50% over 60 years. Over 70 years the input was 391,000 tons and the outgo 773,000 tons of P_2O_5. German soils show progressively increasing P deficiency; in 1936 33% were P-deficient, in 1940/41, 46.9% and in 1941/42, 48.6%. The annual loss is 12.4 kg. of P_2O_5/ha. or 0.41 mg. per 100 g. of soil.

It is not advisable to apply small dressings of P_2O_5 on soils very deficient in P, since the P is absorbed by the soil rather than by the crop. P_2O_5 dressings (of 30 kg./ha.) should not be applied to very acid soils unless they can be adequately buried. The P_2O_5 usually should be applied to the root zone and not as a top-dressing. Active P_2O_5 should be applied as shortly before sowing time as possible. The more acid the soil the greater are the losses of active P_2O_5 on long storage in the soil. Timing is immaterial on grassland.

Recorded crop yields show that the efficiency of P-dressings decreases as the soil is better provided with P except in the cases of sugar beet and meadow hay; average yield increase was 18.3% on a soil containing 1-5 mg. and 1.6% on soil containing 26-30 mg. of P_2O_5.

Data from 1400 experiments show that P manuring pays better on good soils than on light soils although the latter are more deficient in P. Crumb structure is improved by P_2O_5; in long-period trials on loam water-stable aggregates increased from 40.6% on no-P plots to 53.0% on plots receiving 120 kg./ha. of P_2O_5.

The following increases in kg. are obtainable from 1 kg. of P_2O_5—grain 6.2, potatoes 46, sugar beet 51, mangolds 125, meadow hay 26.3, rape seed 5.3.

Practical measures to enhance the phosphate status of soils during phosphate scarcity are outlined.—K.S.

[1388] 631.85 : 546.185-33

MARIANI, E. [**Recent developments in phosphatic fertilizers: calcium metaphosphate.**] *Chim. Indust. Milano* 29, 1947 (71-74). B.A.BIII, 1949 (4).

Methods of production, chemical properties and fertilizing action of Ca metaphosphate

are discussed. The T.V.A. pilot plant at Wilson Dam, Alabama, is described. Though not competing with super., the metaphosphate is suitable for the preparation of highly concentrated mixed fertilizers for special purposes including intensive cultivation under Italian conditions, and contains 65% of assimilable P_2O_5.

[1389] 631.851
LEMMERMANN, O.; RAUTERBERG, E. Die Wirkung von Rohphosphaten auf sauren Mineralböden. [**The action of rock phosphates in acid mineral soils.**] *Z. PflErnähr. Düng.* 43, 1949 (97-109). [G.]

In pot experiments with a sand soil of pH 4.82 (in water) rock phosphate had a considerable effect on oats receiving (a) NH_4NO_3 or (b) NH_4 humate, and this effect persisted with the succeeding crop of mustard. In a loam of pH 5.7 the phosphate had an effect on the first crop only with (a) and on the succeeding crop when (a) or especially (b) had been applied to the first crop.

[1390] 631.851 : 631.411.4
BRÜNE, F. Welche Böden eignen sich zur Düngung mit Rohphosphaten? [**Which soils respond to manuring with mineral phosphates?**] *Z. PflErnähr. Düng.* 41, 1948 (233-245). [G.] [Bremen]

The P_2O_5 of the soft mineral phosphates, e.g., Algerian phosphate, has proved equal to that of basic slag in experiments on acid high-moor soils of Germany. Regardless of how long the top soil has been cultivated, the acid subsoil will ensure that the mineral phosphate will be effective. Ploughed-up grassland will, however, respond to mineral phosphate only for about 10 years; on a 16-year-old moorland meadow basic slag was superior to mineral phosphate. The effectiveness of mineral phosphate on mineral soils depends on pH value.—K.S.

[1391] 631.851 : 631.811.2
LEMMERMANN, O.; RAUTERBERG, E. Über die Ausnutzung schwerlöslicher Phosphorsäureverbindungen durch sogenannte Tiefwurzler und Flachwurzler nebst einigen anderen Fragen der Stoffaufnahme. [**The utilization of difficultly soluble phosphoric-acid compounds by so-called deep-rooting and shallow-rooting crops and other questions of nutrient uptake.**] *Z. PflErnähr. Düng.* 43, 1949 (1-18). [G.]

Experiments confirmed that legumes, buckwheat and mustard take up rock phosphate better than Gramineae, weight for weight. This capacity for greater P uptake was not sufficiently explained in terms of the relative sizes of their root systems. It is pointed out that, to ascertain the true effect of a nutrient, both the aboveground and underground parts should be taken into account, and that even then, because of the losses—which vary considerably with conditions—due to the dissimilation processes, the values obtained do not correspond with the total quantities of substance produced by the plant during its growth.

[1392] 631.858 : 631.547.1
MANNING, H. L. **Fertilizer trials.** *Uganda Dept. Agric. Rept. 1946-47*, 1949 (25-30).

Responses to silico-phosphate have generally been disappointing, but a small dressing to groundnuts after planting gave satisfactory results. Silico-phosphate depressed the germination of acid-treated and untreated cotton seed and it is possible that poor results with silico-phosphate may be due to its effect on germination, especially when it is applied before or soon after planting. The effect of rock phosphate is not similar.

[1393] 631.858 : 631.812
GERICKE, S. Amerikanische Arbeiten über die Herstellung von Phosphorsäuredüngemitteln (Glühphosphaten) aus Rohphosphaten. [**American work on the preparation of phosphate fertilizers (calcined phosphates) from rock phosphates.**] *Z. PflErnähr. Düng.* 43, 1949 (146-153). [G.]

A review with 45 references.

[1394] 631.859.42
BAEYENS, J.; SCHEYS, G.; APPELMANS, F. Fosfor in grond en plant. [**Phosphorus in soil and plant.**] *Agricultura* 46, 1948 (24-104). [Fl.]

Pot and field experiments carried out in 1943 and 1944 to compare the manurial value of magnesium ammonium phosphate (PAM) with equivalent mixtures are described. PAM contains 30% of P_2O_5 soluble in 2% citric acid, 5% of ammoniacal N and 17.2% of Mg. Oats were grown in Mitscherlich pots (in triplicate) at 4 levels of treatment. Field trials on a standard replicated

lay-out were carried out at 30 centres. The experimental results are generally in favour of PAM.

It is claimed that PAM is superior to other P fertilizers because it is pedologically and physiologically adapted to the growth medium. PAM is initially fixed by the soil, but in a favourable medium (pot culture) ammonia is rapidly liberated and assimilated and the P remains in a soluble and available form as Mg phosphate. The latter does not revert to insoluble ferric phosphate because it is liberated only as the ammonia disappears. The N and P of PAM become soluble and available simultaneously whilst this occurs separately and more slowly in fertilizer mixtures. The following facts are claimed to confirm the theory :

(a) The P content of the percolate from the PAM pots was much higher (8-16 mg.) than that from the other fertilizer pots (2-5 mg.). (b) The N of PAM appeared earlier in the percolate as nitrates than the N of the other treatments (in unplanted pots), The N of PAM was, however, utilized to a greater extent since the N content of plants in PAM pots was higher than in plants grown with the other fertilizers. (c) There was a clear parallel between the passage of P and N into the percolate from the PAM pots, but not from the others. (d) P assimilation depends on the stage of growth ; the available-P content of the soil of the pots was much higher at the end of growth than at the beginning in all pots. (e) The content of dry matter, starch, sugar and protein of the crops in the pot experiments was highest in the PAM treatments ; the combination of P, N and Mg in one chemical compound thus appears to stimulate the physiological activity of the plant.—K.S.

631.86/7 ORGANIC FERTILIZERS

(*See also* Abs. Nos. 1368, 1447)

[1395] 631.86/7 : 631.81

MARTIN-LEAKE, H. **Agriculture in its world setting.** *Emp. Cott. Grow. Rev.* 26, 1949 (100-108).

The role of humus in its physical and biological effects on soil is discussed and a plea is made against the use of artificial fertilizers.

[1396] 631.86 : 577.17

SAUERLANDT, W. Die Wuchsstoffwirkung organischer Düngemittel. **[Hormone activity of organic manures.]** *Z. PflErnähr. Düng.* 41, 1948 (148-158). [G.]

The test material was a brewing yeast. In preliminary experiments yeast growth increased linearly with increasing amounts of dung in the range 0-100 mg. of dung per flask.

Dung from different cows showed 100% variation in activity, expressed as yeast growth per g. of organic matter in the dung. Dung from all cows showed a steep decline in activity from October to December-January and an increase beginning in February-March. A control experiment did not determine whether yeast growth was normally seasonal.

Among the litters tested for hormone activity potato tops were active, but not sawdust or peat. Tests with manure made from dung of a herd, using different types of litter, gave the highest values with potato-top litter and practically no activity with peat and sawdust. Pregnancy was not a factor. The hormone activity of farmyard manure is correlated with the exchange capacity of the ripe dung.—K.S.)

[1397] 631.86 : 631.414.3.03

SAUERLANDT, W. Die Umtauschkapazität von Stallmist. **[The exchange capacity of farmyard manure.]** *Z. PflErnähr. Düng.* 41, 1948 (53-64). [G.]

The development of sorbing boundary surfaces during the rotting process was examined in samples of manure made with different litters (straw, potato tops, sawdust, peat, etc.). Exchange capacity was measured by Schachtschabel's method, at alkaline and acid reactions. In the alkaline range sorption occurs mainly at carboxyl, or phenolic hydroxyl groups, but in acid humus substances, phenolic hydroxyl does not participate in the exchange processes. After pre-treatment with acetic acid the farmyard manure exhibited exchange capacities of 85-217 m.e./100 g. of organic matter, with a mean value of 150 m.e. On the alkaline side the values were 15-350 m.e., mean 250 m.e. Exchange capacity, T, measured without acetic-acid pre-treatment increased during rotting. Two opposing processes are distinguishable (1) degradation : one group of

substances which at high exchange capacity can be easily decomposed by bacteria and which must be derived from the dung, (2) synthesis substances formed from the litter that correspond to humus or humus precursors and are synthesised or developed during rotting. The relative rate of bacterial decomposition of (1) and production of more stable boundary surfaces (2) determines the exchange capacity. The exchange capacity, T_1, measured in the acid range decreased during rotting except in the case of peat manure where there was a slight increase.

There were no great differences in exchange capacities T in fresh dung and in rotted dung, but considerable decreases in T_1 measured after acid treatment. Since T expresses cation binding by phenolic hydroxyl (Tp) as well as by carboxyl groups it follows that Tp has risen during rotting. The increase of cation binding by phenolic hydroxyl was 84% of the fresh-dung value in manure made with straw, potato haulms or sawdust and only 23% in manure made with previously rotted litter.—K.S.

[1398] 631.862 : 577.17
SAUERLANDT, W. Untersuchungen über den Gehalt an Humus und Nährstoffen sowie über die Wuchsstoffwirkung von Jauche und Harn. **[The humus content and nutrient content and the hormone activity of liquid manure and urine.]** *Z. PflErnähr. Düng.* 41, 1948 (109-126). [G.]

Analytical data are recorded for urine and for liquid manure after drainage into the storage pit. Considerable amounts of acid-precipitable and acetyl-bromide-insoluble humus substances were detected in the liquid manure, particularly in summer. Urine fermented in the laboratory showed little humus formation. The organic matter and nitrogen content of the urine varied considerably due to the differences in breed and environment of the cattle. The ratio of organic matter to N was linear. This function was applicable also to liquid manure. In low-N samples, 5.3 g. of organic matter corresponds to 1 g. of N, in high-N samples 3.8 g. of organic matter to 1 g. of N. Humus formation in liquid manure, in which lignin is restricted to that derived from the dung, is attributed to melanoid production according to the Maillard reaction. Comparative tests for hormone activity on yeast cells indicated rather higher values for liquid manure than for fresh urine.—K.S.

[1399] 631.874
LIMBURGERHOF LANDWIRTSCHAFTLICHE VERSUCHSSTATION. Bedeutung der Ernterückstände für die Ernährung am Beispiel des Zwischenfruchtfutterbaues. **[Importance of crop residues with nutrition of catch crops.]** *Z, PflErnähr. Düng.* 41, 1948 (127-132). [G.]

Weight and NPK content of total residues are recorded on PK- and NPK-manured plots for (1) stubble forage crops (sunflower, rapes, mustard, maize, marrowstem kale, peas, etc.) and (2) overwintering catch crops (rapko, rye, rye-vetch mixtures and Landsberg mixture). In the stubble crops, 50 kg./ha. of N increased the weight of residues of millet by 1.8 dz./ha., of winter rape by 7.4 dz. and of rapko by 10.3 dz. In the overwintering crops, 50 kg./ha. of N increased rye-vetch residues by 2.4 dz./ha., and rye residues by 6.5 dz., but though the increase was lower the total amounts of residues were nearly double in the overwintering crop. It is estimated that root residues from 1 ha. of catch crops return to the soil about 20 dz. of organic matter, with 35 kg. of N, 20 kg. of P_2O_5, 50 kg. of K_2O. By intensive catch cropping it is possible to return to the soil about one quarter of the organic matter and one fifth of the nutrients supplied by a liberal dressing of farmyard manure.—K.S.

[1400] 631.875 : 631.531
LAWRENCE, W. J. C. **Recent work with seed and potting composts.** *Sci. Hort.* 9, 1949 (29-34).

[1401] 631.875 : 631.812
GOUDRIAAN, H. P. Compost en de bereiding ervan. **[Compost and its preparation.]** *Landbouw* 19, 1947 (323-327). [Du.]

A succession of four compartments made of bamboo and measuring $2 \times 1\frac{1}{2} \times 1\frac{1}{2}$ m. is set up on an open patch of ground. Waste materials such as chopped banana stalks are well mixed, stable manure added if possible, and spread in a layer in the first compartment that is covered with a mixture of ashes and soil, and a layer of chopped grass or hedge clippings. This is repeated daily for

7 days when the compartment becomes full. In dry seasons the mass is sprayed with sufficient river water, so that when a stick is inserted into the heap it feels warm and moist when withdrawn. Compartments 2, 3 and 4 are filled during the 2nd, 3rd and 4th weeks respectively. During the 5th-8th weeks the material from successive compartments is forked out through a sliding door into a walled space measuring 8 × 8 m. where the heaps are turned. This is repeated during the 9th-12th weeks after which the compost is ready for use. The "factory" described can deal with 180 m.^{3} of refuse per year to give 45 m.^{3} of high-grade compost.

[1402] 631.875 : 631.812
HACKENBERG, P. N. Compostering. [**Composting.**] *Landbouw* 20, 1948 (505-520). [Du.e.]

A plea is made for the more efficient utilization of agricultural waste material in Indonesia by composting. A fairly good compost can be made by treating rice straw in heaps with manure or cyanamide.

[1403] 631.875 : 631.841.7
GERRETSEN, F. C.; MANTEN, A.; MULLER, F. M. Kunstmatige broeimest uit stro. [**Artificial hot-bed manure from straw.**] *Meded. Direct. Tuinb.* 12, 1949 (140-149). [Du.e.] [Landbouwproefsta. Bodemk. Inst. T.N.O., Groningen]

Urea, but not $CaCN_2$, was a suitable substitute for stable manure in the preparation of hot-bed manure, and caraway straw could be used in place of cereal straw. Spraying the upper layers of straw with a small quantity of concentrated fertilizer solution was more effective than treating the bulk with a large volume of dilute solution. In the former case heat production began in the top layers and gradually penetrated the deeper layers, thus lasting longer than when the whole of the straw produced heat at the same time. This was an important factor in dealing with cold weather in May. Large-scale application of the method was shown to be feasible and economic.

[1404] 631.875 : 631.85
REINHOLD, J. Die Wirkung des Biophosphat-Phosphatogens und des Biophos als Kompostzusatz. [**The effect of Biophosphat-Phosphatogen and of Biophos as additions to compost.**] *Z. PflErnähr. Düng.* 39, 1947 (258-279). [G.]

The preparations consist of decalcified bone meal containing about 30% of P_2O_5 with added bacterial preparations or $KMnO_4$. The main virtues claimed by the producers are a shortening of the composting process, the elimination of turning the heap and the killing of weed seeds. Composts of different plant and soil composition, turned or unturned, treated with the preparations or with old compost material, or untreated, were submitted to a wide variety of chemical, physical and plant-growth studies. There was nowhere a marked advantage from the use of the preparations. A single turning was as efficient and more economic, and the preparations are most uneconomic as sources of P_2O_5.

[1405] 631.875 : 631.879.2
BOULD, C. **Soil organic matter and composts.** *Sci. Hort.* 9, 1949 (23-28).

Some of the most important sources of soil organic matter that are now used to supplement the decreasing supplies of farmyard manure are sewage sludges, green manures and composts. In this revision-course paper the experimental work on refuse-sludge composts is summarized and the technique of compost-making is described.

[1406] 631.876.9 : 634.61
HUME, E. P. **Coir dust or cocopeat—a byeproduct of the coconut.** *Econ. Bot.* 3, 1949 (42-45). [Mayaguez, P.R.]

Cocopeat is now being produced commercially in Puerto Rico and is of value as a rooting, mulching, soil-conditioning and seed-germinating medium. Only four authors have dealt with its use, and their findings are discussed. In experiments at Mayaguez the only difficulty found in mulching with cocopeat was its light weight. When dry it was liable to be blown away or a sudden, violent rain would cause sufficient run-off to float the mulch away.

[1407] 631.878
BRÜNE, F. Wie ist der Torf als Dünger und Bodenverbesserungsmittel für Mineralböden zu bewerten? **[The value of peat as a manure and soil improver for mineral soils.]** *Z. PflErnähr. Düng.* 38, 1947 (39-47). [G.]

On the whole, the experiments carried out in Germany do not, in the absence of economic studies, support the use of low-moor peat on agricultural mineral soils. In gardens and vineyards, however, the use of peat as compost is in general economically sounder, and low-moor peat has been of great use both in the establishment of forest on sterile sands and at later stages, apparently through an improvement in N nutrition.

[1408] 631.878
REINHOLD, J. Zusammensetzung, Wirkung und Wert des Handelshumusdüngers "Nettolin". **[Composition, action and value of the commercial humus fertilizer "Nettolin".]** *Z. PflErnähr. Düng.* 41, 1948 (20-42). [G.]

Results of 6 years' experiments with Nettolin (a peat product treated with NPK) at different experiment stations are summarized. The manufacturer claims that Nettolin has about 10 times the manurial value and 4 times the organic matter of farmyard manure. These claims were substantiated in field trials. The maximum profitability of Nettolin dressing is about 80 dz./ha. Farmyard manure can be replaced by $\frac{1}{10}$ of the amount of Nettolin without a decline in yield and soil organic matter. If the organic matter is valued as peat, the price should be about half the market price.—K.S.

[1409] 631.878
RUSCHMANN, G. Versuche zur biologischen Prüfung von Humusdüngern und Humusstoffen. **[Biological examination of humus fertilizers and materials.]** *Z. PflErnähr. Düng.* 41, 9148 (97-109). [G.]

Carbon-dioxide evolution and counts of micro-organisms are recorded . The soil was a good neutral soil receiving N, P and K. In CO_2 evolution, the six materials tested fell into 3 groups (of descending activity): (1) Nordenham bacterial fertilizer, lime-lignin (a wood-pulp by-product) and Nettolin ; (2) Huminal B and lignite-peat compost; (3) Biohum, which had no effect on soil respiration. The soil showed considerable variation in spore counts, and there was little increase on adding the humus fertilizers, except that Nordenham, which promoted CO_2 evolution, increased the spore count tenfold.

In pots, lime-lignin, Nettolin and Hubadünger considerably increased spore count, whilst Huminal B, Biohum and Edelmist had no significant effect. In field soil, however, Biohum and Edelmist stimulated azotobacter. Hubadünger was outstanding in promoting cellulose degradation. Lime-lignin and potash-lime-lignin promoted the development of actinomycetes.—K.S.

[1410] 631.879.2
LEIGH, H. G. **Use of digested sludge and digester gas for the production of dried grass.** *Surveyor* 108, 1949 (37-38). C.A. 43 (3131).

Digested sludge is used to fertilize grasses for cattle fodder and is augmented with K and lime to maintain the soil fertility.

[1411] 631.879.2 : 551.481
SAWYER, C. N. **Fertilization of lakes by agricultural and urban drainage.** *J. New Engl. Water Works Assoc.* 61, 1947 (109-127). B.A.BIII, 1949 (105).

Lakes at Madison are subject to severe algal growths which derive most of their inorganic N and P requirements from sewage effluents. Biologically purified sewage from 750 persons supplies as much inorganic N, and that from 212 persons as much P, as occurred in the drainage from one square mile of agricultural land. 30-60% of the N received by the lakes was retained.

632 PLANT DISEASES, WEEDS AND PESTS. PLANT PROTECTION

(*See also* Abs. Nos. 1224, 1463, 1466, 1468, 1474, 1568)

[1412] 632.111
ROGERS, W. S. **Frost damage to fruit. The present position of research in England.** *Agriculture* 56, 1949 (86-90). [E. Malling]

Detailed records are being maintained on frost incidence in various field trials, in relation to factors such as rootstock, pruning, manuring and ground cover.

[1413] 632.111 : 551.509.53

CHUDNOVSKY, A. F. **[A method of forecasting radiation frost based on calculations of the heat balance of the soil.]** *Dokl. Akad. S.-Kh. Nauk.* No. 8, 1948 (35-40). [R.]

The minimum night temperature is forecasted from the following formula:

$$T_{min} = T_o - B\ (AM + DN)$$

Where To is the temperature at sunset, B the balance of radiation at the same moment, M and N are coefficients of heat exchange and depend on the wind and soil moisture at sunset, and A and D are coefficients determined by the time and place, i.e., by the month and latitude. Clouds introduce a complication and the whole result has then to be multiplied by the value $m = 1 - kn_1 - kn_2 - kn_3$, where n_1, n_2 and n_3 are the amount of cloud corresponding to the upper, middle and lower layers, and k_1, k_2 and k_3 are coefficients determined by the amount of retention of radiation by clouds in the same layers. The significance of the different coefficients is shown in tables and the radiation balance for a clear sky is found from a nomogram. Some results have shown an accuracy of up to 90%. As this method is still in the experimental stage there are several details which need further elaboration.

[1414] 632.2

OVERGAARD, C. **Studies on the soil microfauna. I. The moss-inhabiting nematodes and rotifers.** *Naturvidenskabelige Skrifter* 1, 1948, pp. 98. Helminth. Abs. 17 (208).

[1415] 632.2 : 631.43

RHODESIA TOBACCO RESEARCH BOARD. **Root knot nematode.** *Rhod. Agric. J.* 45, 1948 (451-452).

The heat of the sun renders the top 2 inches of the soil almost free from nematode at the end of the dry season, but infestation is heavy from 2 to 12 inches. The nematode population moves upwards when the rains come.

Groundnuts and cotton seem to be almost as effective as bare fallow in reducing nematodes. Cotton is recommended as a crop to precede tobacco.

[1416] 632.2 : 632.953

LEPAGE, H. S.; GIANNOTTI, O.; ORLANDO, A. Notas sôbre o combate ao nematóide da raiz (*Heterodera marioni*) pelo fumigante DD. **[The control of the root nematode *Heterodera marioni* with DD.]** *O Biológico* 13, 1947 (123-124). [Pt.] Hort. Abs. 18 (271).

In soil infested with *Heterodera marioni*, yam beans produced a greater yield of tubers with fewer root nodules, where DD had been injected into the soil before sowing.

[1417] 632.2.005

OVERGAARD, C. **An apparatus for quantitative extraction of nematodes and rotifers from soil and moss.** *Natura Jutlandica* 1, 1948 (271-278). Helminth. Abs. 17 (206).

[1418] 632.4 : 576.809.7

BJÖRKMAN, E. **Soil antibiotics acting against the root-rot fungus (*Polyporus annosus* Fr.)** *Physiol. Plant.* 2, 1949 (1-10). [E.]

A number of micro-organisms were collected from different forest-soil samples, isolated and tested as to their antibiotic effect on the growth of *Polyporus annosus*. Most of those found active against the root-rot fungus were unable to produce substances of permanent antibiotic stability.

[1419] 632.599.8 : 633.22

MUSGRAVE, M. M. **Control of Californian thistle with cocksfoot.** *N.Z. J. Agric.* 78, 1949 (23).

On suitable soils the use as a smother crop of cocksfoot grown for seed appears to be a useful alternative to the use of lucerne. The cocksfoot is cut for seed when the Californian thistle (*Cirsium arvense*) is at the flowering stage, causing the thistle a severe check.

[1420] 632.732 : 631.452

HARRIS, W. V. **Some aspects of the termite problem.** *E. Afric. Agric. J.* 14, 1949 (151-155). [Dept. Agric., Uganda]

There are indications that activities of termites in East Africa at altitudes of less than 5000 feet are not altogether beneficial. They probably influence soil fertility and through this the distribution of natural vegetation. Amongst the topics discussed are the biology of termites; their function

in promoting soil fertility; the difference in chemical composition and physical properties between termite mounds and the surrounding surface soil; the presence of lime nodules in East African termite mounds; the breaking up and disposal of mounds previous to mechanical cultivation; the role of termites in the accumulation of humus in soil; the relationships between termites and vegetation, and termites and soil erosion.

632.95 INSECTICIDES. FUNGICIDES. HERBICIDES

(*See also* Abs. Nos. 1502, 1507)

[1421] 632.951

GERRITSEN, J. D. Bodembehandeling met Hexyclanstuif ter bestrijding van engerlingen en ritnaalden. **[Soil treatment with Hexyclan dust for controlling cockchafers and wireworms.]** *Meded. Direct. Tuinb.* 11, 1948 (655-659). [Du.]

Some control of cockchafer grubs in strawberry beds was obtained by a row application of 5% benzene hexachloride (666) at rates of 2 and 3 kg./are in October; 1 kg./are in autumn and 1½ kg./are in spring were insufficient. The material was applied dry and mixed with the soil.

Treatment of greenhouse soil with 1, 1½ or 2 kg. of benzene hexachloride per are effectively controlled wireworms. Applied before planting, the material did not affect the taste or smell of a lettuce crop.—K.S.

[1422] 632.951 : 631.435

CHULSKI, K. **The effect of benzene hexachloride on some crops grown on various soil types.** *Mich. Agric. Expt. Sta. Quart. Bull.* 31, 1948 (170-177).

A 5% wettable benzene-hexachloride dust containing 12% of the γ isomer was applied at rates equivalent to 800, 400, 200 and 100 lb./acre to pots in which sweet corn, snap beans, cucumbers and radishes were sown immediately after application of the dust. Three light and two heavy-textured soils were used. No harmful effects on snap beans were observed. The amounts above which injury was caused on other crops in light soils were: sweet corn, 100 lb.; cucumber, 400 lb.; radishes, 100 lb. On heavy soils applications of 400 lb. damaged sweet corn, but not cucumbers, while radishes were unharmed by 800 lb./acre.

[1423] 632.951 : 631.81

COMPTON, C. C. **Chlordane in fertilizer.** *Agric. Chem.* 4, No. 5, 1949 (29, 93).

Chlordane-fertilizer mixtures containing 1-8 lb./acre of chlordane have effectively controlled white grubs, mole crickets and wireworms attacking such crops as potatoes, and have considerably stimulated plant growth, due probably to the control of hitherto little-considered pests such as springtails, mites, etc. Dosages up to 20 lb./acre broadcast have not damaged potatoes or tobacco, and 15 times the lethal dose for wireworm on tobacco has caused no injury when applied as a wettable powder in transplanting water. Preliminary stability studies show that chlordane has remained completely stable for 6 months in certain proprietary fertilizer mixtures, but it should not be mixed with fertilizer containing appreciable amounts of lime or alkali.

[1424] 632.953 : 631.43

MCCLELLAN, W. D.; CHRISTIE, J. R.; HORN, N. L. **Efficacy of soil fumigants as affected by soil temperature and moisture.** *Phytopath.* 39, 1949 (272-283). [U.S.D.A., Beltsville]

The efficacy of Larvacide (chloropicrin) D-D, Dowfume G (10% methyl bromide in ethylene dichloride and carbon tetrachloride) and Dowfume W-15 (15% ethylene dibromide in naptha) against *Heterodera marioni*, *Fusarium oxysporum* and *Sclerotium rolfsii* was investigated at two soil-moisture levels and six soil temperatures varying from 45° to 101°F. Larvacide was rapidly effective against all three organisms at 98° but only slightly effective against *Heterodera* at the lower temperatures. *Heterodera* was completely killed at 82° or 98°F. after 1 day and at 62° or 72°F. after 3 days by D-D, but *Fusarium* and *Sclerotium* were unaffected. Dowfume G showed a slight effect against *Heterodera* only. Dowfume W-15 was effective against *Sclerotium* at 72°, 82° or 98°F., and against *Heterodera* at 98° after 1 day and at all temperatures after 3 days. In general, the fumigants were most effective in wet soils and were retained the longest in wet, low-temperature soils.

[1425] 632.954
SEELY, C. I.; KLAGES, K. H.; SCHAFER, E. G. **Controlling perennial weeds with sodium chlorate, carbon bisulfide, and borax.** *Wash. Agric. Expt. Sta. Bull.* 505, 1948, pp. 23.

[1426] 632.954 : 577.17 : 631.81
MARTH, P. C.; HARDESTY, J. O.; MITCHELL, J. W. **Stability of 2,4-D when stored with mixed fertilizer.** *Agric. Chem.* 4, No. 5, 1949 (41, 82).

Mixtures of 2,4-D and fertilizer containing up to 7% of moisture were heated to 60°C. for 2 weeks immediately after preparation and were then stored at ordinary temperatures for 10 months, without loss of potency of the 2,4-D.

[1427] 632.954.8
DOMEIJ, Å. Några skogs- och lundväxters känslighet för natriumchlorat. **[The sensitivity of some forest and meadow plants to sodium chlorate.]** *Medd. Statens SkogsforskInst.* 37, No. 6, 1949, pp. 16. [Sw.e.]

The sensitivity of different species varies widely and $NaClO_3$ can consequently be used as a selective weedkiller. The most sensitive species were *Calluna vulgaris* and *Hypericum quadrangulum*, which were killed by 2.5-5 g. of $NaClO_3$ per square metre. *Potentilla erecta* and *Trientalis europaea* were among the most resistant herbs, surviving doses of 40 g./sq.m. Trees and bushes were generally resistant, except young spruce. Oak, birch, rowan, whitebeam and poplar appeared to benefit from chlorate by increased growth, possibly as a result of decreased root competition. Regeneration of oak and poplar was very vigorous on chlorate-treated areas.

633.1 CEREALS

(*See also* Abs. Nos. 1277, 1573, 1577, 1602)

[1428] 633.1-1.84
OPITZ, K.; EGGLHUBER, E. Über die Reaktion von Getreidesorten auf verschieden starke Düngung mit Stickstoff. **[The response of cereal varieties to different rates of nitrogen manuring.]** *Z. PflErnähr. Düng.* 42, 1948 (11-20). [G.]

The numerous plant-breeding data available in the literature, particularly those of the Bavarian Plant Breeding Institute, indicate that Petkuser rye, Krafts Dickkopf wheat and Eglfinger Hado barley are the most productive and reliable yielders under conditions of deficient, moderate and intensive nitrogen manuring, and will therefore be the most useful varieties for soils of any nutrient status. Pot experiments are reported on 5 oat and 5 barley varieties carried out to test varietal response to physiologically acid and alkaline N and P fertilizers. The barley varieties Heisa and Hado differed little in response; some varieties definitely preferred the physiologically acid fertilizer (super. + $(NH_4)_2SO_4$), others the physiologically alkaline (basic slag + $NaNO_3$).—K.S.

[1429] 633.11-1.4 : 581.192
DELLA GATTA, L. Influenza della varietà, del clima e del terreno sulla qualità del grano. **[Influence of variety, climate and soil on the quality of wheat.]** *Atti Relaz. Accad. Pugliese Sci.* 5, 1947, pp. 16. Field Crop Abs. 2 (33). [I.]

[1430] 633.11-1.5
KIESSELBACH, T. A.; LYNESS, W. E. **Growing the winter wheat crop.** *Neb. Agric. Expt. Sta. Bull.* 389, 1948, pp. 32.

The effects of the following cultural practices on the yield of winter wheat were investigated: (1) Response to crop rotation: the use of sweet clover and farmyard manure in the crop rotation increased the yield by 11.5 bu./acre or 31% as compared with the yields of unfertilized rotations without legumes. (2) Early seed-bed preparation: ploughing at an early date after the removal of a previous small-grain crop yielded 10.6 bu./acre or 51% more than late ploughing. Any yield increase resulting from ploughing deeper than 7 inches probably would not offset the greater cost of the ploughing.

[1431] 633.11-1.582
SHIER, F. L.; CULLINANE, W. P. **The influence of rotation on the yield and flour strength of wheat.** *J. Dept. Agric. W. Aust.* 25, 1948 (351-361).

The inclusion of a two-year leguminous pasture period has frequently given two or threefold yields over those obtained from continuous cropping. The "strength" of wheat was improved through the use of the legume.

[1432] 633.11-1.811

ZAMFIRESCU, N. **Rhythm of growth of wheat; influence of fertilizers.** *Bull. École Polytech. Jassy* 1, 1946 (186-206). B.A.BIII, 1949 (107).

Differences between wheat varieties with respect to growth rhythm are accentuated by fertilizer treatment and become more marked as the plants approach maturity. Considerable varietal differences are demonstrated in the period at which utilization of fertilizer nutrients begins and in the capacity of the plants to utilize fertilizers. In the growth of spring wheat two critical periods are distinguished: that commencing 6-8 days before the appearance of the ear, and lasting for 2-3 weeks, and the period of intense development of the grain. Climatic or nutritional factors disturbing the rhythm of these critical phases markedly influence the yield and quality of the grain.

[1433] 633.11-1.811.6-1.83

SCHREIBER, R. Über den Einfluss der Magnesium-gehalte der verschiedenen Kalidüngmittel auf Ertrag und Qualität von Sommerweizen. **[The effect of the magnesium content of various potassium fertilizers on the yield and quality of summer wheat.]** *Z. PflErnähr. Düng.* 43, 1949 (69-77). [G.] [Justus-Liebig Hochschule, Giessen]

In pot experiments (a) kainite, (b) K_2SO_4, (c) kalimagnesia, (d) 40% K salts and (e) a brand of (d) containing 5% of $MgSO_4$, or various rates of (f) $MgSO_4$ or (g) $MgCl_2$ to test the effect of the anions, were applied to a quartz sand receiving basal N and P. Highest total yields were given by (c) and (e), but (a) was best for grain development and yields. No important effect on the raw, digestible or pure protein content of grain or straw was found as a result of any treatment. K and Mg uptake by grain was similar for all treatments, the K : Mg m.e. ratio being 1 : 1, but with the straw Mg uptake was greatest with (c). With (f) and (g) the largest Mg uptake, for a given K content, always resulted from the largest applications.

[1434] 633.11-1.84 : 581.192

VEIJOLA, T. Vehnän valkvaispitoisuudesta ja sühen vaikuttavista tekijöistä. **[The protein content of wheat and factors affecting it.]** *Maatalous ja koetoiminta* 3, 1948 (120-135). Field Crop Abs. 2 (34). [Nat. Inst. Tech. Res., Helsinki]

The effect of N fertilizer on wheat quality is not very marked.

[1435] 633.11-2.4-1.84

DALY, J. M. **The influence of nitrogen source on the development of stem rust of wheat.** *Phytopath.* 39, 1949 (386-394). [Univ. St. Paul, Minn.]

Nitrogen source did not influence the rust reaction of susceptible, resistant or moderately susceptible wheat in the field.

[1436] 633.15-1.842.4

HARPER, H. J.; BRENSING, O. H. **Effect of ammonium nitrate on corn production in Oklahoma in 1948.** *Amer. Fert.* 110, No. 3, 1949 (11, 24, 26, 28).

50 lb. of NH_4NO_3 applied as a side dressing on maize fertilized with a starter fertilizer at planting, produced an average increase in maize yield of 9 bu./acre over a starter fertilizer; 100 lb. produced 3.6 bu. more than did 50 lb. and 150 lb. produced 4.1 bu. more than did 100 lb. Heavy applications of N should not be made unless the physical condition of the soil is very favourable for moisture storage and deep root development.

[1437] 633.16-1.84

BADISCHE ANILIN- UND SODA-FABRIK. LANDWIRTSCHAFTLICHE ABTEILUNG. Was leistet der Stickstoff im Gerstenbau? **[The effect of nitrogen in barley cultivation.]** *Z. PflErnähr. Düng.* 39, 1947 (227-245). [G.]

The effect of 20-60 kg./ha. of N was studied over 10-15 years in about 1000 experiments with summer and 260 with winter barley in the main German growing areas. With summer barley, the mean basal fertilizing was 42.5 kg./ha. of P_2O_5 and 71 of K_2O. The yield increase from 1 kg. of N fell from 20.5 kg. of grain at the 20-kg./ha. level of fertilizing to 13 kg. at the 60-kg. level. On the average, N applications up to 50 kg./ha. were economic. N efficiency was rather greater on the heavy and medium than on the lighter soils, of lower water-holding capacity. The yields from basal and com-

plete fertilizing were higher on neutral or alkaline than on weakly acid soils, but N efficiency was rather greater on weakly acid or neutral soils. The crop was usually the second and sometimes the third crop after manure; the data were insufficiently uniform for determining the effect of position in the rotation on N efficiency. Preceding crops showed no differential effects.

For winter barley, basal fertilizing was 47 kg./ha. of P_2O_5 and 91 kg. of K_2O. N was given largely in spring, and this time of application gave the highest yields. The kg-efficiency of N rose slightly between the 20 and 40 kg./ha. levels and then fell sharply, the economic limit being reached at 60 kg./ha. At the 40 kg./ha. level, yields were greater on heavier soils, but N efficiency was as great in loamy sands and sandy loams as in loams and clays and was greatest on weakly alkaline soils. The crop was usually the third after manuring and N efficiency was greater here than when the crop came second or fourth after manuring, and was also unaffected by the type of preceding crop.

The whole series of experiments with the N fertilizing of cereals indicates that the kg efficiency of N decreases in the order: oats, winter rye, winter barley, winter wheat and summer barley.

[1438] 633.18-1.3
PIACCO, R. **Mechanical rice harvesting in Italy.** *Risicoltura* 36, 1948 (218-221, 254-257). B.A.BIII, 1949 (108).

The possibilities and special difficulties of mechanization are discussed with special reference to the soft and wet condition of the soil.

[1439] 633.18-1.416.1
BHUIYAN, S. **Transformation of nitrogen in rice soil.** *Soil Sci.* 67, 1949 (231-237). [Dacca Univ., India]

The total N content remained more or less constant throughout the year. The NH_3 content of the soils remained at a relatively high level soon after water-logging. It then decreased and remained at a low level, completely disappearing from one of the plots studied, only a trace being present in the other plot. Nitrate was absent during the waterlogging period, began to accumulate in one plot after harvest, but was only present as a trace in the other. Hydrolysable N fluctuated irregularly. Soluble N was at its maximum in July and August. The results on the whole show that the different conditions that exist in a rice field have little influence on the organic make-up of the soil.

[1440] 633.18-1.5
MIRCHANDANI, R. T. **Role of cultural improvements in the increased production of paddy in Sind.** *Indian Farm.* 8, 1947 (386-390). [Agric. Res. Sta., Dokri, Sind]

Details of preparatory cultivation for rice on the saline soils of Sind. The seedlings are raised by the dry method and the preparation of the seed beds is described. An economical amount of $(NH_4)_2SO_4$ is 100 lb./acre, but the largest increase in yield in experiments at Dokri has been obtained with a combination of $(NH_4)_2SO_4$ and super. in the proportion of 100 : 75. Second (*dubari*) crops are grown after rice in North Sind; wherever possible it is advisable to grow leguminous crops for this purpose.

[1441] 633.18-1.58
GUPTA, P. S.; MITRA, A. K. **Double cropping of rice as a means of increasing production.** *Indian Farm.* 9, 1948 (96-98). [Rice Res. Sta., Nagina]

An early variety of paddy was broadcast in April at a rate of one maund/acre, manured in May with 40 lb./acre of N as castor cake and harvested in July. After preparing the plot, a late coarse variety was transplanted in early August and one half of the plot supplied with castor cake equivalent to 65 lb. of N per acre. Yields from the unmanured and manured halves were 39 maunds 37 seers and 46 maunds 13 seers respectively. Consideration of the costs involved showed that, under United Provinces conditions, double cropping and manuring is economic as well as a means of increasing food supplies.

[1442] 633.18-1.581
COOK, J. **Fallow season cultivation of irrigated padi land in Malacca.** *Malay. Agric. J.* 31, 1948 (115-118).

Holdings where fallow-season cultivation is most extensively pursued vary in size from 2-12 acres. Owing to a reduction in the numbers of pigs found on these holdings during the war, greater use is now made of

prawn dust, fish refuse and nightsoil as manures. Short-termed padi strains are favoured and harvesting begins at the end of December. The surface is then "skimmed" with a changkol and, after drying, the stubble is heaped and burnt. The land is ploughed and bunded, and short-term crops such as turmeric, ginger, beans, cucumbers, tomatoes, chillies, celery, lettuce, mustards and sweet potatoes are planted in holes filled with earth from the burnt stubble heaps. Frequent top dressings of liquid manure are applied, while the bunds are heavily mulched with padi straw.

[1443] 633.18-1.584

CHIAPPELLI, R. **[Catch cropping in rice fields.]** *Risicoltura* 36, 1948 (172-174). B.A.BIII, 1949 (8).

Suggestions are made for catch cropping in rice fields to conserve moisture and fertility. Recommended crops include red clover, rye and other grain. Preliminary preparation of the soil and the fertilizers required are indicated.

[1444] 633.18-1.81

FFRENCH-MULLEN, M. D. **Rice experiments. I. Fertilizer trials.** *Fiji Agric. J.* 19, 1948 (4-10).

Randomized treatments of $\frac{1}{40}$th-acre plots comprised: (a) 22.4 lb. of NPK; (b) 22.4 lb. of NPK plus a spray containing Cu, Mn, Zn, B and Fe; (c) 22.4 lb. of NPK plus 168 lb. of coral sand; (d) 5.6 lb. of NPK; (e) 11.2 lb. of super.; (f) 11.2 lb. of super. plus 5 cwt. of farmyard manure; (g) 5 cwt. of farmyard manure; (h) 168 lb. of coral sand; (i) 5.6 lb. of $(NH_4)_2SO_4$, and (j) control. The complete fertilizer contained 6% N, 9% P_2O_5 and 6% water-soluble K_2O. Mean yields of padi, in lb., from each treatment were: (a) 39.25; (b) 45.25; (c) 49.67; (d) 47.67; (e) 49.58; (f) 47.17; (g) 45.75; (h) 55.33; (i) 43.17, and (j) 46.50. The only significant increase was that obtained by application of coral sand; this also resulted in a higher yield of straw. No treatment affected the incidence of "leaf yellows" disease.

[1445] 633.18-1.81

HWANG, S. T.; PEI, P. I.; HWANG, T. T. **A nine-year report of a continuous fertilizer experiment on rice.** *J. Agric. Assoc. China*, No. 188, 1948 (1-14). [Ch.e.]

In a nine-year experiment of 3 × 3 × 3 design, the first factor was a basal dressing of night soil, compost and green manure, the second, a subsequent dressing of $(NH_4)_2SO_4$ or rape-seed cake and check, and the third, liming and check. Fertilizers were applied on a basis of 3 kg. of N per 666.7 sq. m. (6 catties/mow), and lime on a basis of 60 catties of CaO per mow. Rape seed and winter wheat were grown as winter crops for the first four, and subsequent years, respectively. The results from nine rice crops showed that night soil was more effective than compost or green manure, although in the later years, the effects of night soil and compost were comparable. The continuous application of night soil tended to lower the supply of available P and K. Application of both basal and subsequent dressings was necessary to obtain maximum yields, $(NH_4)_2SO_4$ and rape-seed cake being equally effective. Soil organic matter was not increased by compost or green manure. There was some relation between liming and soil structure, but liming, which was found to be unnecessary, did not change soil acidity. N fertilizers increased resistance to attack by stem borer.

[1446] 633.18-1.81

KAPP, L. C. **Rice fertilizer experiments 1938-45.** *Ark. Agric. Expt. Sta. Bull.* 477, 1948, pp. 36.

Rice grown on the soil at the Rice Branch Station responded to application of N. Broadcasting N on the dry soil gave higher rice yields than broadcasting it on the irrigation water after the fields were flooded. Cyanamide and $(NH_4)_2SO_4$ were more conducive to increasing grain yeilds than were compounds carrying nitrate N. For maximum rice production on new prairie soils it was necessary to add P to the soil. Irrigation with well water improved the productivity of new rice and soils for several years.

[1447] 633.18-1.874

GIESSEN, C. VAN DER Groenbemesting bij sawahrijst. **[Green manuring of sawah rice.]** *Landbouw* 19, 1947 (195-209). [Du.]

Three papers on the green manuring of sawah rice in Java are reviewed, with respect

to choice of green-manure crop, cover crops, effects on yield and food value, comparison with $(NH_4)_2SO_4$ and super., rice varieties and application.

[1448] 633.18-2.191-1.811.3
AIYAR, S. P. **The effects of potassium deficiency on rice.** *Proc. Indian Acad. Sci.* 28, 1948 (202-226).

K-deficiency symptoms occurred in rice on a soil which, according to analytical data, was well provided with all the nutrient elements. It is suggested that the depression of K absorption by plants induced by the ionic antagonism of Ca and Mg on the one hand, and assimilation of an abnormally high proportion of K by the large population of micro-flora in the soil under examination on the other, were the main factors involved. Plants manured with K_2SO_4 were normal but P depressed the effect of K when the 2 nutrients were used together.

633.2/3 GRASSES. LEGUMES

(*See also* Abs. Nos. 1250, 1309, 1385, 1610)

[1449] 633.2/3-1.81
WATSON, S. J. **The manuring of grasses and clovers.** *Farming* 3, 1949 (110-113).

[1450] 633.2.03-1.4 : 581.192
VRIES, D. M. DE; KOOPMANS, J. Het verband tussen de hoedanigheidsgraad van grasland en standplaatsfactoren. **[The relationship between the degree of quality of grassland and environmental factors.]** *Landbouwk. Tijdschr.* 61, 1949 (21-37). [Du.e.] [Cent. Inst. Landbouwk. Onderz. Wageningen]

The relationship between degree of quality (g*Q*) of the sward on one hand and the weather conditions, humidity, clay-humus, organic matter, particle size, P and K status, degree of base saturation, pH, soil type and utilization on the other, was determined by investigating 600 grasslands of different types. Quality was best on soils of normal humidity and with clay-humus contents of 11-20 and 21-40%. Quality improved with P status up to a citric-soluble value of 80, and with increasing K and base saturation. The optimal pH value was about 6.3, but if other factors are favourable good quality grassland occurs on soils of pH 5.1-5.5.

[1451] 633.2.03-1.4 : 581.5
LEENHEER, L. DE; CAESTECKER, K. DE Onderzoek van de invloed van bodemvariatie op het grasbestand in een vetweide te Lampernisse. **[The influence of soil variation on the sward of a fat pasture at Lampernisse.]** *Meded. LandbHoogesch. Opzoekingssta. Gent*, 13, 1948 (261-277). [Fl.]

The aim of the experiments was to determine whether the frequency-estimation method applied to 25 grass samples was accurate enough to distinguish between two apparently uniform swards in a field characterized by two different soil types. The permanent pasture at Lampernisse had been brought to the state of a first-class fat pasture (carrying 3 cows per ha.), and the herbage appeared uniform to the eye in regard to grass and weed species. The two soil profiles did not differ materially in mechanical and chemical composition, the differences being mainly in the subsoil.

The frequency data recorded actually show up a difference of 8.32% in the plant associations carried on the two profile types; statistical treatment shows that this difference is significant (at 3 to 1 level) and that the frequency-estimate method is applicable to pasture.—K.S.

[1452] 633.2.03-1.582
KACHINSKY, N. A. **[The teaching of W. R. Williams on the grass-rotation system of agriculture.]** *Pochvovedenie* 1949 (65-78). [R.] [Dokuchaev Inst., Moscow]

The most important features of the system, which has now become the basis of Russian agriculture, are: (1) The general introduction of the correct rotations suited to the locality and invariably including grass and legume leys to maintain soil structure.
(2) A special system of soil cultivation, including ploughing to a depth of at least 20 cm. with a skim coulter at optimal moisture content. An autumn ploughing is given, following a stubble cultivation, and another cultivation prior to sowing.
(3) The most economic use of fertilizers, including locally produced manures, factory residues, etc.
(4) The widespread introduction, especially in the steppes, of protective forest strips to serve as windbreaks, to moderate the effects of drought, and to retain the winter snowfall on the fields.

(5) The planned utilization of the land, primarily on the basis of relief —e.g., forests on watersheds, grain crops and leys on slopes, (the "field" rotation) and vegetables, technical crops and others with high soil requirements (the "food" rotation) on bottom lands. The food rotation will also contain grains and grasses. Grasses occupy about half the food rotation and a third of the field rotation.

[1453] 633.2.03-1.582-1.67
RYZHOV, S. N. **[The controlled transformation of the nature of soils in conditions of irrigated agriculture.]** *Pochvovedenie* 1949 (79-94). [R.] [Tashkent]

According to the law of the five-year plan for 1946-50 the mean yield of cotton in Uzbekistan will be 22.4 centners/ha. In the following five years it should be raised to 30-35 centners/ha. These yields cannot be maintained by the usual practice of growing cotton for about 6 years after lucerne, with or without fertilizers. Yields fall, at first slowly, and more quickly in the 5th and 6th years. It is claimed, however, that constant high yields of cotton can be assured, under the conditions prevailing in Central Asia, by substituting for lucerne a 2-3-year ley of lucerne and cocksfoot. There is considerable difficulty in getting the cocksfoot established, but this can be obviated by giving an N fertilizer. Adequate fertilizing, preferably with both organic and inorganic manures, needs to be done to both ley and cotton, but fertilizing alone without a ley will not maintain soil fertility.

Other recommended measures are in accordance with the teachings of V. R. Williams, viz., the establishment of protective forest belts in irrigated areas and along irrigation canals and deep cultivation to produce an arable layer 30 cm. (1 ft.) in depth. It is stated that the adoption of these measures will increase the effectiveness of water utilization 3-4 times.

[1454] 633.2.03-1.81
GIÖBEL, G. **Recent results of the application of nutrients to pastures.** *J. Brit. Grassland Soc.* 4, 1949 (69-71).

N manuring of natural pastures showed, on the whole, similar effects to N manuring of pasture leys on arable land. There appeared to be an interaction of some importance between N and P, yield increases with P being further increased by simultaneous manuring with saltpetre. The effects of P, K and N on quality were particularly marked on natural pastures. Palatability was also considerably improved. Very large amounts of saltpetre up to 4800 kg./ha. had no deleterious effects in years of normal or fairly abundant rainfall, but in dry years a pronounced thinning out of *Poa pratensis* took place when the fertilizer was applied in amounts of 3,600 and 4,800 kg./ha. and was replaced by couch grass, a reversal of the process taking place as soon as moisture conditions again became favourable for *Poa pratensis*.

[1455] 633.2.03-1.83-1.58
HART, M. L. 'T Een kalibemestingsproef bij weiden en maaien. **[An experiment on potash fertilizing of grazed and mown grassland.]** *Versl. Landbouwk. Onderzoek.* 54, No. 7, 1948, pp. 34. [Du.e.]

Potash was applied over four years to grass on peat soil at 8 rates varying from 0 to 320 kg./ha., the grass being mown either 3-4 or 5-6 times. Other plots, grazed by cows, received potash at rates of 0, 60 and 120 kg./ha.

Yields were increased by up to 8-10% in all cases. On the mown plots the optimum effect was got with 200-290 kg./ha. of K_2O, and on the grazed plots with 60 kg./ha. On the mown plots the amount of K_2O removed in the crop was greater than that applied, even with 320 kg./ha. On the mown plots the percentage of K in the dry matter of the grass decreased during the course of the experiment, but increased on the grazed plots. There was an insignificant increase in the fat percentage of milk from the no-K plots. The botanical composition of the grazed plots was not much influenced by K. On the mown plots *Poa trivialis* and *Phleum pratensis* were encouraged, and *Poa pratensis* and *Agrostis stolonifera* discouraged, by application of K.

[1456] 633.3-1.461.52
ALLEN, O. N.; ALLEN, E. K. **A survey of nodulation among leguminous plants.** *Proc. Soil Sci. Soc. Amer. 1947*, 12, 1948 (203-208). [Univ. Wis., Madison]

This paper summarises the information that is available on the extent to which nodulation occurs in the Leguminosae. Current estimates of the number of species

of leguminous plants vary between 10,000 and 12,000, contained in 429-455 genera; in studies of nodulation only 964 species have been mentioned, and of these 887 are consistently reported as having nodules, and 77 as having none. Nodules may be present in some species of a genus and absent in others, notably in the genus *Cassia* where 16 species are reported to have nodules and 20 to be without. There is no suggestion that the occurrence of nodules is related to the geographical distribution of the plants. In recent years nodule studies have been deflected from mere recording of the occurrence of nodules in new species and have dealt more with the infective ability of rhizobial strains. The differentiation of rhizobia into species has depended largely on the ability of any given organisms to form nodules on particular plants, but evidence is accumulating of the versatility of these organisms.—L.M.C.

[1457] 633.317-1.5
McKEE, R. **Bur-clover cultivation and utilization.** *U.S.D.A. Farm. Bull.* 1741, 1949, pp. 12.

Medicago arabica and *M. hispida* are the two varieties commonly cultivated in the United States.

[1458] 633.34-1.5
LAGOS, U. J. A. Cultivo de la soya. **[Cultivation of the soybean.]** *Rev. Agric. Costa Rica* 20, 1948 (365-367). Field Crop Abs. 2 (45). [Sp.]

[1459] 633.35-1.5
McKEE, R. **Vetch culture and its uses.** *U.S.D.A. Farm. Bull.* 1740, 1949, pp. 23.

[1460] 633.367-1.5
PRELLER, J. H. **Lupines.** *Farm. S. Africa* 24, 1949 (25-29). [Coll. Agric., Potchefstroom].

History and management.

[1461] 633.374-1.415.1
HOWELL, H. B. **A legume for acid soils. *Lotus uliginosus* (*L. major*).** *Oregon Agric. Expt. Sta. Bull.* 456, 1948, pp. 25.

Lotus major can be grown on soils of pH 4.5-5.5 without limestone and there are indications that this range of acidity is preferred by the plant to more nearly neutral or alkaline soils. Inoculation is absolutely necessary for the establishment of *L. major.*

633.491 POTATOES

[1462] 633.491-1.5
CUETO ROBAINA, I. Observaciones sobre el cultivo de la papa. **[Notes on potato cultivation.]** *Estac. Expt. Agron. Habana Pub. Misc.* 1, 1948, pp.20. [Sp.]

[1463] 633.491-2.2-2.953
BOOCK, O. J. O fumigante "Dowfume W-10" no contrôle aos nematóides de batatinha. **[Dowfume W-10 in the control of potato nematodes.]** Repr. *Rev. Agric. Piracicaba* 24, No. 1-2, 1949 (25-42). [Pt.e.]

30 gall./acre of Dowfume W-10 were injected at about 12-15 cm. depth with spacings of 20 or 40 cm. and potatoes were planted on the same day or 1 or 2 weeks later. Untreated plots gave 97% of infestation in harvested potatoes as against 35 and 40% of weak infestation with injections 1 and 2 weeks before planting and with a 20-cm spacing.

[1464] 633.491-2.4-1.415.1
TERMAN, G. L.; STEINMETZ, F. H.; HAWKINS, A. **Effects of certain soil conditions and treatments upon potato yields and the development and control of potato scab.** *Me. Agric. Expt. Sta. Bull.* 463, 1948, pp. 31.

Experiments conducted in 1935-47 show that scab became severe on the less acid, darker, poorly drained loam than on the more acid, lighter coloured, well drained loam. Severe infection can be reduced by applications of S or $(NH_4)_2SO_4$. Finely ground S applied at 1 ton/acre in 1935 was toxic to potatoes for 1-3 years. Applications of 300, 600 and 900 lb./acre in 1946 were not toxic and had little effect on yield. The extra N applied as $(NH_4)_2SO_4$ increased yields in the late growing season of 1946, but decreased yields in the 1947 season which was cut short by frost. Potato yields were greatest in soils of pH 4.55-6.00. There was little difference in the effect of green-manure crops, stable manure, straw or peat on either potato yields or development of scab. 1 ton of ground limestone applied to acid loam gave a good stand of clover, but with 500 and 1000-lb. applications the stand was poor.

633.5 FIBRE CROPS

(*See also* Abs. Nos. 1571, 1578)

[1465] 633.52-1.415.8

MOLFINO, R. H. Influencia de la reaccion del suelo sobre el rendimiento de un ensayo de linos oleaginosos. **[The effect of soil reaction on yield in a trial of linseed varieties.]** *Rev. Fac. Agron. La Plata* 26, 1948 (235-257). [Sp.e.]

The conclusion from earlier years of the same trial (see *Soils and Fert.* 7, p. 171) that the pH tolerance of linseed is in general 6.1-6.7 is revised. Highest yields occurred at pH 7 and the range of tolerance is put at 6.6-7.6 except for the variety H39 which also tolerated more acid conditions.

[1466] 633.52-2.4-1.5

FREDERIKSEN, P. S. Hørrustens udbredelse, skadevirkning og bekaempelse. En fare vor spindhørdyrkning! **[The distribution, injurious effect and control of flax rust. A menace to our spinning-flax cultivation!]** Repr. *Ugeskr. Landm.* 18/19, 1948, pp. 8. R.A.M. 28 (173).

As the straw is the sole means of perpetuating rust (*Melampsora lini*) the flax should be carefully pulled and transported. Other control measures include: thorough ploughing-under of stubble; K should be liberally and N sparingly applied to the soil; low-lying areas rich in humus should be avoided.

[1467] 633.523-1.5

SINHA, A. C. **Jute cultivation in Bihar.** *Indian Farm.* 9, 1948 (413-417).

633.6 SUGAR CROPS

(*See also* Abs. No. 1355)

[1468] 633.61-2.181

SARTORIS, G. B.; BELCHER, B. A. **The effect of flooding on flowering and survival of sugar cane.** *Sugar* 44, No. 1, 1949 (36-39). [U.S.D.A.]

The effects of natural floods on sugar cane growing in muck soil in southern Florida is described. The first response was a growth of roots on the submerged nodes. Completely submerged plants died, but those with the growing point of the stem above water survived. It is possible that flooding induced flower development.

[1469] 633.63-1.432.2 : 581.192

HADDOCK, J. L. **The influence of plant population, soil moisture, and nitrogen fertilization on the sugar content and yield of sugar beets.** *Agron. J.* 41, 1949 (79-84). [Bur. Pl. Indust., U.S.D.A.]

In sugar beet, growth response to added N fertilizer is markedly influenced by the plant population as well as by the N-supplying power of the soil. Although sugar beet is not highly sensitive to variations in soil-moisture conditions, wide differences in yield were obtained from different irrigation programmes. Time of irrigation may be more important than the amount of water used. Sugar beet should be kept growing vigorously early in the season. A side dressing of N fertilizer in mid-season had little effect on yield, but may be advantageous with optimum soil-moisture conditions. With wide spacing, N lowered the percentage of sugar and purity of expressed juices.

[1470] 633.63-1.557 : 581.144.4

LESCH, W. Zusammenhang zwischen der Ertragsbildung und der Blattentwicklung bei der Zuckerrübe in verschiedenen Wachstumsabschnitten. **[Relationship between yield and leaf development in the sugar beet.]** *Z. PflErnähr. Düng.* 42, 1948 (47-66). [G.]

Growth records were made on beets grown in glazed pots in 1944 and 1945. The beets were harvested every three weeks from the beginning of July. No clear relationship was found between leaf development and beet yield at the various harvest dates. A comparison of yields of the 2 years showed the dependence of assimilation efficiency on weather. A relationship was therefore sought by comparing fresh active leaf mass with beet and sugar yields at shorter intervals. A correlation was found between leaf area and assimilation efficiency which was, however, again dependent on weather. This correlation could be seen better in bulk samples than in individual beet plants. At normal harvest time green leaf was almost without significance; sugar content was affected only by premature leaf death. The data showed that the dead-leaf fraction is inversely proportional to sugar content. Sugar yield is greater the lower the leaf proportion.—K.S.

[1471] 633.63-1.811

LEHR, J. J. Laboratoriumproeven ter bestudering van de invloed van bemesting op groei en minerale samenstelling van de suikerbiet. IV. De invloed der kationenverhoudingen op de ontwikkeling van de suikerbiet. Potproef op dusarit-zandmengsels—1942. **[Laboratory experiments for the study of the influence of manuring on the growth and mineral composition of sugar beet. IV. The influence of the cation relation on the development of sugar beet. Pot experiment on dusarit-glass sand—1942.]** *Meded. Inst. Ration. Suikerprod.* 17, *1947*, 1948 (65-109). [Du.e.f.]

The composition of the root and the foliage clearly reflected the composition of the adsorption complex. The foliage showed preference for Na and the root for K.

[1472] 633.63-1.816.32

SCARPONI, F. Metodi di concimazione e produzione della bietola da zucchero. **[Manuring and production methods with sugar beet.]** *Soc. Gen. Montecatini, Serv. Tec. Agrar. Quad* No. 1, 1947. Field Crop Abs. 2 (62).

Best results were obtained by placing ⅔ of the fertilizer at 15-20 cm. depth before sowing and ⅓ in contact with the seed. This system is particularly suitable for K fertilizers.

[1473] 633.63-1.84

STUMPEL, J. M. H. Stikstof-proefveld Strijen 1943. **[Nitrogen-trial field at Strijen 1943.]** *Meded. Inst. Ration. Suikerprod. 1946*, 16, 1948 (235-256). [Du.e.f.]

In order to get a profitable response to N fertilizing of sugar beet it is essential that adequate supplies of other nutrients should be available. There was a negative correlation between the Na content of the roots, and a positive correlation between the K content of the leaves, and the sugar content.

[1474] 633.63-2.2-2.953

SIMON, M. La lutte contre le nématode de la betterave par la désinfection du sol. **[The attempt to control nematode of sugar beet by soil disinfection.]** *Inst. Belge Amélior. Better. Pub.* 17, No. 2, 1949 (15-25). [F.fl.e.]

The following fumigants were tested for nematode control and sugar-beet growth and shape: Shell DD, Dowfume N, Dowfume W-40, Iscobrome D and the Belgian products orthodichlorbenzene, tetrachlorethane, trichlorethylene and Sambroline, a mixture of mono- and di-chloronapthalenes. Only the first 2 were efficient. Spring application of 400 kg./ha. of Shell DD gave a good crop in infected soil, but 800 kg. severely damaged germination, growth and root shape in heavy soils.

[1475] 633.65-1.5

TKATCHENKO, B. Le sucre de palme du Cambodge. **[The sugar palm of Cambodia.]** *Agron. Trop.* 3, 1948 (563-593). [F.]

The sugar palm, *Borassus*, provides almost all the sugar consumed in Cambodia. True palm groves rarely occur, but the trees are planted along roadsides, on the bunds of rice fields and around the villages and pagodas. They can tolerate drought and prolonged inundation and can grow on any type of soil, but prefer virgin soils. The physical and chemical properties of some soils supporting sugar palms are tabulated. After planting the seed at a depth of about 10 cm. no further cultivation is carried out.

[1476] 633.685-1.5

SANKARAM, A. **Cultivation of *Dioscorea alata* L.** *Indian Farm.* 9, 1948 (411-412).

633.7 STIMULANTS

(*See also* Abs. No. 1415)

[1477] 633.71-1.459-1.61

COPLEY, T. L.; BRITT, C. S.; POSEY, W. B. **Conservation practices for tobacco lands of the flue-cured and Maryland belts.** *U.S.D.A. Misc. Pub.* 656, 1948, pp.44. [Raleigh, N.C. and Beltsville, Md.]

The greatest single factor contributing to erosion on tobacco land is the slope of the fields. Other factors are the erodibility of soils that are suitable for the cigarette type of tobacco, and the use of faulty row systems. The best erosion-control measure for land in tobacco is a good row lay-out in which the rows act as miniature terraces and drain all the way through to the outlet with a moderate but continuous grade. In an improved method for obtaining this row lay-out, usually called the "string method", a guide row is first laid out for each interval

between terraces and all other rows are parallel to this guide row. The method can be adapted to different terrace patterns. Terrace outlets, secondary waterways in tobacco fields, cultural practices and rotations are discussed. The late turning in of vetch-nonlegume covers increased both crop value and erosion control. Mulch was the most effective method of erosion control on slopes that were too steep for the usual methods of control.

[1478] 633.71-1.5
BROWN, D. D. **Turkish tobacco culture in Southern Rhodesia.** *Rhod. Agric. J.* 45, 1948 (523-547).

The cultivation of Turkish tobacco in Southern Rhodesia is confined generally to sandy loams of granite or sandstone origin, or to "contact" soils which occur in pockets where granite and epidiorite, or dolorite, granite and banded ironstone, granite and schist, or sandstone and basalt are in contact. The contact soils are more fertile and produce heavier yields of fine, silky-textured, full-bodied leaf. Coarse-textured sandy soils produce low yields of poor quality. Turkish tobacco should not follow immediately after a legume in the rotation. Crops not susceptible to eelworm should be grown in the rotation; lists of hosts of eelworm and of crops resistant to eelworm infestation are given. 4-, 5-, 6- and 7-course rotations are suggested using legumes, maize, grass and cotton.

Applications of compost or 10-20 tons/acre of farmyard manure should be applied to seed beds 3 months before final preparation after the beds have been sterilized by heat and the surplus ash removed. 2-10 lb./of NPK fertilizer should be added per 10 sq. yd. just before seeding. Retarded growth of seedlings due to N deficiency can be remedied by applying 1 lb. of $NaNO_3$ in 8 gall. of water to 20 sq. yd., or liquid fowl manure. Fertilizers are recommended for different types of soil.

[1479] 633.71-1.5
STREET, O. E. **Producing cigar tobacco in Pennsylvania.** *U.S.D.A. Farm. Bull.* 2001, 1948, pp.32. [Penn. St. Coll.]

[1480] 633.71-1.5
VEN, L. F. J. M. VAN DER De teelt van tabak. **[The cultivation of tobacco.]** *Meded. Tuinb. VoorlDienst* 46, 1949, pp. 93.

[1481] 633.71-1.588.1
ELECTRICAL REVIEW. **Tobacco growing.** *Elect. Rev. Lond.* 143, 1948 (869). B.A.BIII, 1949 (111).

Heating the soil in which tobacco seeds are germinated is carried out in glass cloches, by means of bare galvanized iron wires running six inches below the surface. Germination takes place within 14 days.

[1482] 633.71-2.192-1.81
BORTNER, C. E.; WEEKS, M. E.; KARRAKER, P. E. **Injury to tobacco seedlings from excessive fertilizer applications.** *Ky. Agric. Expt. Sta. Bull.* 513, 1948, pp. 15. Hort. Abs. 18 (289).

Injury to tobacco seedlings is only likely to arise from excessive applications of fertilizer when followed by drought. Such damage may be avoided by applying not more than 1450 lb. of a 6-8-6 fertilizer per acre, and watering weekly at $\frac{1}{2}$ gall./sq.ft. in dry weather.

[1483] 633.73-1.81
CHOKKANNA, N. G. **Manurial experiments on coffee at the Coffee Research Station, Balehonnur.** *Indian Coffee Bd. Mo. Bull.* 12, 1948 (3-5). Hort. Abs. 18 (306).

A latin-square manurial experiment with coffee is described, and yields over eight years recorded. The results are not statistically significant.

[1484] 633.73-1.81
PEREIRA, H. C. **Manures and fertilizers.** *Coffee Bd. Kenya Mo. Bull.* 13, 1948 (36-38). Hort. Abs. 18 (306).

The first season's results from long-term coffee manurial trials are outlined.

[1485] 633.75-1.81 : 581.192
GERICKE, S. Wirkung verschiedener Wachstumsfaktoren auf Ertrag und Ölgehalt von Mohn. **[Effect of different growth factors on the yield and oil content of poppy.]** *Z. PflErnähr. Düng.* 40, 1948 (19-35). [G.]

A survey of recent work. Soil type is not very important, but yields are higher on good soils than on light soils which are usually deficient in P_2O_5 and CaO. pH range is narrow; the optimum pH is 6.0-6.5.

This is an important factor in the choice of fertilizers. Wet and cold conditions in the spring and early summer upset growth; dryness and hot conditions in August and September promote seed formation and ripening. Ammoniacal and nitrate fertilizers are equally effective, provided that pH conditions are satisfied. Oil content is a maximum when the P_2O_5 content of the seed is about 2.3%. A yield of 15 dz./ha. of poppy seed and straw contains about 60 kg. of P_2O_5 of which over 50% is found in the seed. The crop requires about 5 dz./ha. of phosphate fertilizer (16% P_2O_5). Most of the N and K is recovered in the vegetative parts of the plant.—K.S.

[1486] 633.75-1.84
NEHRING, K. Aussaatzeit- und N-Düngungsversuche zu Mohn. **[Time of sowing and nitrogen manuring experiments on poppy.]** *Z. PflErnähr. Düng.* 42, 1948 (31-39). [G.] [Rostock]

Development in the poppy depends largely on sowing date, early sowing being of great importance in regard to yield of seed and oil and response to N. Under German conditions the optimum sowing date is about the first week in April.—K.S.

[1487] 633.79-1.811
THOMPSON, F. C. **The nutrition of the hop plant. A review of the literature.** *Wye Coll. Dept. Hop Res. Rept. 1948*, 1949 (20-31).

[1488] 633.79-2.4-1.811.4
PIZER, N. H.; CRIPPS, E. G.; THOMPSON, F. C. **Hop *Verticillium* wilt. An account of soil and nutrition investigations at Wye in the years 1944-47.** *Wye Coll. Dept. Hop Res. Rept. 1948*, 1949 (32-48).

Ca and Si content of laminae and petioles was higher and N content was lower in infected gardens than in healthy plants, but the level of petiole Ca does not seem to be affected by the level of soil Ca. It may be that the Ca levels are characteristic of the hops examined and that there are possibly high- and low-Ca strains of Fuggles hops. It is possible that those with low-Ca levels in leaves and petioles are less susceptible to wilt. There is an indication from leaf analysis that application of Na salts might depress the intake of Ca by plants.

633.8 AROMATIC, MEDICINAL AND OIL PLANTS

(*See also* Abs. No. 1603)

[1489] 633.8-1.5
SIEVERS, A. F. **Production of drug and condiment plants.** *U.S.D.A. Farm. Bull.* 1999, 1948, pp. 99. [Bur. Pl. Indust.]

[1490] 633.841-2.4-1.436
CHOWDHURY, S. **Diseases of *pan* (*Piper betle*) in Sylhet, Assam. Part VIII. Effect of temperature on the development of Sclerotial wilt of *pan*.** *Proc. Indian Acad. Sci.* 28B, 1948 (240-246).

Optimum soil temperature for the development of the disease was found to be 28°C. although at 25° and 30°C. the disease was quite severe. There were no deaths at 15° and 40°C. At 20°C. there were more deaths than at 35°C.

[1491] 633.841-2.4-1.58
CHOWDHURY, S. **Diseases of pan (*Piper betle*) in Sylhet, Assam. Part VII. Effects of some soil treatments on the incidence of Sclerotial wilt.** *Proc. Indian Acad. Sci.* 28B, 1948 (228-239). [Cent. Potato Res. Inst., New Delhi]

The sclerotial wilt of pan as it occurs in Assam can be effectively controlled by deep ploughing, green manuring, application of organic manures and fertilizer, and by growing other crops in the infested fields for a few years. Minor elements, Zn, Cu, Fe, Mn and Mg as the sulphates were ineffective. $(NH_4)_2SO_4$ alone or with super. and KCl or either of the latter was effective in suppressing the disease. Super. or KCl applied singly or in combination were less effective but kept the mortality below that of the control plots. Lime and gypsum had no effect.

[1492] 633.852.52-1.5
NEUMARK, S. D. **Plans for expanding peanut production in British East and French West Africa.** *Econ. Rev. Food Agric.* 1, No. 2, 1948 (25-35).

[1493] 633.852.52-1.81
KILLINGER, G. B.; STOKES, W. E.; CLARK, F. ET AL. **Peanuts in Florida. I. Peanut growing. II. Chemical composition of the peanut plant.** *Fla. Agric. Expt. Sta. Bull.* 432, 1947, pp. 47.

300 lb./acre of 2-10-4 fertilizer applied 7-10 days before planting gave the best yields. If applied at the time of planting, the fertilizer should be placed to the side of the seed. Results from gypsum were erratic; yields were highest when gypsum was applied as a top dressing when flowers just appeared, but satisfactory results have been obtained from applying it with the fertilizer. Colloidal or waste-pond phosphate treatments gave no significant increase in yield and had little noticeable effect on quality. Yields were not affected by using either dolomitic or calcic limestone at rates of 300-1000 lb./acre in the drill row.

Peanuts made most growth from the 56th to the 84th day after planting and adequate supplies of nutrients should be maintained during this period. Ploughing-under of lupins had little effect on yield. Crabgrass was a serious pest after lupins. Sulphur stimulated peanut growth and appeared to increase the P, K and Mg contents of most plants.

[1494] 633.852.52-1.811.4 : 539.16
BLEDSOE, R. W.; COMAR, C. L.; HARRIS, H.C. **Absorption of radioactive calcium by the peanut fruit.** *Science* 109, 1949 (329-330). [Fla. Agric. Expt. Sta., Gainesville]

Peanuts were grown with root and fruiting zones isolated from each other in containers. At 110 days when the fruits were immature, radioactive $CaCl_2$ containing 1.36 mg. of Ca with an activity of 21 me. was applied in 1 l. of nutrient solution for 21 days and to the fruiting medium of another set for 9 days. Ca^{45} thus administered to the roots could be detected after 3 hours in all vegetative parts of the plant, but was found only in the gynophore and ovary of the fruiting stages. After 9 days the shell of fully developed green fruit contained a very small amount of labelled Ca and only a trace was detected in the seed up to the 24th day. When Ca^{45} was administered to the fruiting zone, absorption by gynophores, shells and seeds was much greater. It is suggested that the capacity for Ca absorption by gynophore and ovary is limited after a definite period of development and that further fruit development depends on external supply of Ca in the fruiting zone.

[1495] 633.854.56-1.83
SITTON, B. G.; PAINTER, J. H.; BROWN, R. T. **Increasing tung profits with potassium.** *Better Crops* 33, 1949 (21-24). [U.S.D.A.]

The application of 0.16 lb. of N per tree per year on soils that are relatively rich in K increased yields, but decreased the oil content of tung fruit after 3 to 5 years. The application of K at the rate of 0.75 lb. of K_2O for each pound of N maintained oil content at approximately 21% in whole fruit having a 15% moisture content. The value of the fruit was higher than that fertilized with N only.

[1496] 633.855.34-1.811
HOMÈS, M. V. L'alimentation minérale du palmier à huile *Elaeis guineensis* Jacq. **[Mineral nutrition of the oil palm *Elaesis guineensis* Jacq.]** *Pub. I.N.E.A.C Ser. Tech.* 39, 1949, pp. 124.

Pot-culture experiments indicated that in order to obtain optimum development of the oil palm, nutrient placements were required in the following proportions in gram-equivalents:

K	Ca	Mg	NO_3	SO_4	PO_4
12	12	15	37	12	12

[1497] 633.887.791-1.5
NEUWIRTH, F. Další skušenosti s pěstěním kopretiny starčkoilsté. **[Further experience in the cultivation of Pyrethrum cinerariaefolium.]** *Věst. Čsl. Akad. Zeměd.* 22, 1948 (262-273). Hort. Abs. 18 (271). [Cz.r.e.]

Cultivation in Czechoslovakia.

[1498] 633.888.421-1.84 : 581.192
BOX, M. M. **[The influence of nitrogen fertilizers on some varieties of stramonium, and the alkaloid content during the course of the year.]** *Farmacognosia (Madrid)* 7, 1948 (46-82). C.A. 43 (2724).

Nitrates were most efficacious in increasing the alkaloid content.

634 ORCHARDS. FRUIT

(*See also* Abs. Nos. 1331, 1579)

[1499] 634-1.584

ROGERS, W. S.; GREENHAM, D. W. P. **Soil management with special reference to fruit plantations.** *J. Roy. Agric. Soc. England* 109, 1948 (194-211).

A discussion of cover-cropping systems. The choice of the right crops to suit soil, climate and type of fruit tree is of primary importance.

[1500] 634.3-1.81

NAUDE, C. J. **The fertilizing of citrus.** *Farm. S. Africa* 24, 1949 (15-20). [Nelspruit]

Recommendations for amounts and times of application of NPK. A cover crop should be grown during the rainy season.

[1501] 634.3-2-1.466.1

MARTIN, J. P. **Fungus flora of some California soils in relation to slow decline of citrus trees.** *Proc. Soil Sci. Soc. Amer. 1947*, 12, 1948 (209-214). [Citrus Expt. Sta., Riverside, Calif.]

When citrus trees have been grown on some soils for a considerable number of years a condition arises known as "slow decline of citrus". Yields diminish, there is abnormal die-back, and the amount of new growth is below the normal, although standard fertilizer and pest-control practices have been followed and the general standard of management is good. Young trees planted in these soils make unsatisfactory growth.

The state of affairs is probably due to a combination of nutritional deficiency, deterioration of soil structure, accumulation of toxic substances in the soil and an unfavourable micro-population. The qualitative nature of the fungal flora of old citrus soils is considered in an attempt to find whether citrus plants exert a selective influence on the fungal population.

The soils studied had grown citrus trees for 30-70 years, and the pH varied between 6.0 and 8.0. The routine fungal platings were made on peptone-dextrose agar to which citrus-root extract had been added, and the pH of the medium was brought to 4.0 with sulphuric acid. The great majority of the fungal species found occurred in both old citrus and non-citrus soils, but there were some consistent differences between the two flora. "Several species of *Penicillium*, *Aspergillus*, *Trichoderma*, and occasionally, of other genera constituted the bulk of the mold population of noncitrus soils. The greater part of the fungus flora of the old citrus soils on the other hand, consisted of *Fusarium* spp. 1 and 2, Fungus Dl, *Pyrenochaeta* sp., and various species of *Penicillium*. Fungus Dl and *Pyrenochaeta* sp. were not found in noncitrus soil but were isolated consistently in relatively large numbers from all old citrus soils. *Fusarium* spp. 1 and 2 were found in both old citrus and noncitrus soils, but in much greater concentration in old citrus soils. *Fusarium* sp. 1 was isolated repeatedly from apparently healthy, surface-sterilized citrus feeder roots."—L.M.C.

[1502] 634.3-2.951

RIPLEY, L. B.; PETTY, B. K.; HEPBURN, G. A. **Soil insecticides for the citrus snout-beetle.** *S. Africa Dept. Agric. Sci. Bull.* 259, 1947, pp. 18.

The purpose of the work described was to find chemicals suitable as soil insecticides against *Sciobius granosus* and to obtain general information on the possibilities of various chemicals (70 products were tested) as insecticides against soil insects.

[1503] 634.31-2.19-1.811.3

CHAPMAN, H. D.; BROWN, S. M.; RAYNER, D.S. **Some effects of potash deficiency and excess in orange tree growth, composition and fruit quality.** *Calif. Citrog.* 33, 1948 (278, 279, 290). Biol. Abs. 22 (2543). [Citrus Expt. Sta., Riverside]

Trees suffering from acute K deficiency had pale, small, twisted leaves and few small fruits. With slight K deficiency, fruit was smaller than normal, but quality was good. Excess of K produced large, coarse fruit.

[1504] 634.323-1.81 : 581.192

SITES, J. W. **Internal fruit quality as related to production practices.** *Proc. Fla. St. Hort. Soc.* 60, 1947 (55-62). C.A. 43 (2726).

Nitrate fertilizing did not influence fruit quality. Solids and citric-acid content of grapefruit juice were increased by fertilizing with MgO and K_2O. Vitamin-C content was increased by fertilizing.

[1505] 634.521-1.5
WOODARD, O. **Pecan culture and grove management.** *Ga. Coast. Pl. Expt. Sta. Circ.* 15, 1949, pp. 14.

[1506] 634.521-1.81 : 581.192
HAMMAR, H. E.; HUNTER, J. H. **Influence of fertilizer treatment on the chemical composition of Moore pecan leaves during nut development.** *Plant Physiol.* 24, 1949 (16-30). [U.S. Pecan Field Sta., Albany, Ga.]

Leaf samples were taken at 3-weekly intervals, from June to Sept., from each of four blocks which had been treated for 10 years with $(NH_4)_2SO_4$, $CaCN_2$, NPK and no fertilizer. NPK was applied at 50 lb. per tree, as 6-8-4 in 1936-38 and as 4-8-4 in 1939-45; equivalent amounts of N were applied as $(NH_4)_2SO_4$ and $CaCN_2$. Leguminous cover crops were grown each year. N, P and K contents of the leaves decreased in all treatments from June to September and declined most rapidly from June 11 to July 2, and from August 13 to September 4. At the third sampling N had decreased by 31, 38, 31 and 27%, P by 67, 61, 56 and 59%, and K by 65, 72, 67 and 58% for $(NH_4)_2SO_4$, $CaCN_2$, NPK and no-fertilizer treatments respectively. Ca content rose sharply in all blocks for the first four samplings and then dropped in the N blocks, but continued to increase in the NPK and no-fertilizer blocks. Mg content showed a general rise but decreased in all treatments after August 13 and rose again later ecxept in the NPK treatment. Ash content was fairly constant for all treatments and, with Ca and Mg, was much higher in leaves from NPK treatments than from the check trees. The CaMg/K ratio rose during the entire period of nut development for all treatments. The lowest P level occurred in the N blocks. $CaCN_2$ had a depressing effect on Mg and K contents.

[1507] 634.75-2.951
GOLDSWORTHY, M. C.; DUNEGAN, J. C. **The effect of incorporating technical DDT in soil on the growth of Blakemore strawberry plants.** *Plant Dis. Reptr.* 32, 1948 (139-143). Hort. Abs. 18 (271).

There was a significant reduction in the number of new runner plants and in green and dry plant weights when the concentration of DDT reached 12 lb./acre. At 100 lb./acre the number and the green and dry weights of plants were half those from the 6 lb. plot. The mother plants were not killed.

[1508] 634.771-1.67
EASTWOOD, H. W.; JEATER, J. G. **Supplementary watering of bananas to overcome a major hazard to efficient production.** *Agric. Gaz. N.S.W.* 60, 1949 (89-92, 131-133).

No single practice carried out on New South Wales plantations will increase production to the same extent as supplementary watering.

The method of irrigation is described with a discussion of water storage, reticulation and distribution of water, water application and requirements accompanied by designs of lay-out of piping and a formula for calculating the number of hours it is necessary to operate a sprinkler in each position in order to apply water at the rate of 1 acre inch.

[1509] 634.8-1.5
WINKLER, A. J. **Grapes and wine.** *Econ. Bot.* 3, 1949 (46-70). [Calif. Expt. Sta., Davis]

California produces about 20% of the world's table grapes and 40% of its raisins, but less than 3% of its wines. Grapes are grouped according to use as follows: wine, raisin, table, sweet-juice and canning. The different varieties are discussed in relation to use. The principal grape-producing countries of the world are listed in a table showing the approximate acreage and production of wines, table grapes and raisins for the past 5 years. Climate, vineyard soils, establishment of vineyard, cultivation, irrigation and other operations, and diseases are discussed.

[1510] 634.8-1.811.1
FERRIÈRE, P. J. J. F. DE; RUÈRE, J. G. DE; SIMÉON, S. Influence du climat et du sol sur l'alimentation azotée de la vigne sous climat atlantique. [**The influence of climate and soil on the nitrogen nutrition of the vine in an atlantic climate.**] *C.R.* 228, 1949 (1351-1353). [F.]

The N nutrition of the vine was affected by the rainfall and the pH of the soil.

[1511] 634.8-1.811.2

FERRIÈRE, P. J. J. F. DE; RUÈRE, J. G. DE; SIMÉON, S. Influence du climat et du sol sur l'alimentation phosphatée de la vigne sous climat atlantique. [**The influence of climate and soil on the phosphorus nutrition of the vine in an atlantic climate.**] *C.R.* 228, 1949 (1376-1378). [F.]

The results of foliar diagnosis and soil analyses are shown in graphs and indicate that the P nutrition of the vine is affected by the rainfall and the pH of the soil.

[1512] 634.8-1.911.3

FERRIÈRE, P. J. J. F. DE; RUÈRE, J. G. DE; SIMÉON, S. Influence du climat et du sol sur l'alimentation potassique de la vigne sous climat atlantique. [**The influence of climate and soil on the potassium nutrition of the vine in an atlantic climate.**] *C.R.* 228, 1949 (1453-1455). [F.]

Four factors affect the K nutrition of the vine under these conditions: the seasonal rainfall which is the most important climatic factor, available K, the pH of the soil and the humus content of the soil.

634.9 FORESTRY

(*See also* Abs. Nos. 1185, 1233, 1237, 1238, 1307, 1308, 1407, 1427, 1532)

[1513] 634.9-1.432.2

MAŘAN, B.; LHOTA, O. Pohyb půdní vlhkosti v lese r. 1947. [**Movements of soil moisture in the forest in 1947.**] *Věst. Čsl. Akad. Zeměd.* 23, 1949 (45-51). [Cz.r.e.]

During the critically dry summer of 1947 precipitation in the area under investigation was 65% of the normal amount. In the root zone of trees in different soils the amount of soil moisture was in most cases only 10% of the normal amount. The worst effects were evident in plantations of young larch with grass-covered soil. The depth of the soil horizon and of the ground water influenced the amount of soil moisture, as did also capillarity.

[1514] 634.9-1.471

LUNT, H.; SWANSON, C. L. W. **Mappable characteristics of forest soils.** *J. Soil Water Conserv.* 4, 1949 (5-12, 44).

Under certain conditions survival or growth is reasonably well correlated with one or two specific soil properties, such as texture or thickness of the A horizon, or depth to the C horizon, etc. Other soil-site factors which should be included in the forest-soil legend are: slope and aspect, moisture relations, humus type and a more complete breakdown of stoniness than formerly used. The mapping legend devised for Connecticut soils is described.

[1515] 634.953.6-1.459 : 551.55

CHEPIL, W. S. **Wind erosion control with shelterbelts in North China.** *Agron. J.* 41, 1949 (127-129).

In some regions of North China shelterbelts have been used for many generations to protect very sandy land from erosion by wind. The method consists of growing trees or bushes in single rows 20 to 60 feet apart in one direction and 100 to 500 feet or more apart at right angles to this in the general direction. The whole landscape is thus divided into small rectangular fields protected by shelterbelts on all four sides. This unique system of sand-dune protection and utilization is probably not equalled elsewhere for its magnitude and effectiveness.

[1516] 634.956.4-1.312

TROMP, P. H. M. Grondbewerking in de bosbouw met de schijvenploeg. [**Soil cultivation in forestry with the disc plough.**] *Tijdschr. Ned. Heidemaatsch.* 59, 1948 (427-432). [Du.]

A 3-disc American 'Moline' disc plough is recommended for breaking soil with a grass-heather cover. It can be operated with 3, 2 or 1 discs. The discs are 70 cm. in diameter and can plough to a maximum depth of 50 cm. The furrow width can be varied from 20 to 30 cm. per disc using the 3 discs and to a maximum of 50 cm. using 1 disc. Four advantages of the disc over the share plough are: (1) it requires less tractor power, (2) it deals with dense mat more efficiently, (3) it makes a narrower furrow and leaves the mat nearer the surface to form a water-conserving cover, (4) a good crumb structure follows disc ploughing.—K.S.

[1517] 634.956.4-1.315.4
TROMP, P. H. M. De rotary hoe-grondfrees in de bosbouw. **[The rotary hoe cultivator in forestry.]** *Tijdschr. Ned. Heidemaatsch.* 59, 1948 (390-393). [Du.]

The implement is recommended for clearing heath land and for weeding young plantations, e.g., in which young oaks are sown 1-2 years in advance of the quick-growing larch or douglas firs forming the main plantings.

A diagramatic plantation layout, to which the rotary hoe is applicable, shows uncultivated strips of 1 metre width alternating with cultivated strips of 1.5 metres width; the latter carry a central row of oaks with one or two-year main species on either side. The setting of the hoe for use at the various stages of growth is described. A fertilizer distributor can be attached to the rotary hoe.—K.S.

[1518] 634.972.1-1.445.53
ZONN, S. V.; MINA, V. N. **[The soil-forming significance of oak forests on different soils.]** *Dokl. Akad. Nauk* 63, 1948 (745-748). [R.]

On solonets soils oaks accelerate the podzolization process more rapidly than they do on dark grey soils where podzolization is very slow. The stage of podzolization-solodization is a transition one on solonets soils under an oak stand and is succeeded by a stage of accumulation and the formation of soils analogous but not similar to the grey soils, which have not undergone the solodization process. The application of gypsum to solonets soils may accelerate their amelioration and improve the growth of oaks on these soils.

[1519] 634.975-1.454
NĚMEC, A. **[Biochemistry of *Taxus baccata*.]** *Lesnická Prace* 26, 1947 (1-10). C.A. 43 (1836).

The gradual disappearance of yew from European forests is attributed to the degradation of forest soils, resulting from methods of artificial reforestation, washing out of CaO and mineral nutrients, and acidification of the soil. Yew from a region of eruptive rock in central Bohemia is characterized by a high content of CaO and K_2O in leaves, bark and wood. Like *Abies*, which is also losing ground in Czechoslovakia, yew requires a soil with abundant CaO and K_2O.

[1520] 634.989.84-1.416.2-1.417
STEINER, M. **[Rôle of autolytic breakdown processes in the mineralization of organic phosphorus.]** *Biol. Zbl.* 67, 1948 (84-88). B.A. BIII, 1949 (56). [G.]

In fallen leaves purely autolytic reactions play a quantitatively important part in the mineralization of organic P in dead plant material. Decomposition of a non-microbial type is therefore thought to be of general importance for the natural circulation of P.

635 HORTICULTURE

(*See also* Abs. No. 1572)

[1521] 635-1.67
SCHLEUSENER, P. E.; PEIKERT, F. W.; CAROLUS, R. L. **Results of irrigation on vegetable crops.** *Mich. Agric. Expt. Sta. Quart. Bull.* 31, 1949 (343-350).

Comparison of different irrigation practices and determination of different amounts and times of irrigation on yields of some vegetable crops.

[1522] 635.13-1.85 : 581.192
BEHRENS, W. U. Der Einfluss der Phosphorsäuredüngung auf den Zuckergehalt von Karottenpflanzen. **[The effect of phosphorus fertilizing on the sugar content of carrots.]** *Z. PflErnähr. Düng.* 43, 1949 (144-146). [G.] [Kali-Chemie A.G., Sehnde/Hannover]

Carrots were sown in basally manured quartz sand in pots, some of which received a top-dressing of di-Na phosphate 2 months after sowing. During the first 6 weeks after the P dressing, the plants receiving P contained a smaller percentage of reducing, non-reducing and total sugars, but after 8 weeks the percentage of reducing sugars was higher in the treated roots and whole plants. The quantity of sugar produced per plant was increased by P.

[1523] 635.25-1.5
FERGUSON, W. G. **Onion growing in Queensland.** *Queensland Agric. J.* 67, 1949 (125-134).

[1524] 635.35-2.191 : 546.77
DUNNE, T. C.; JONES, L. T. **Molybdenum for the prevention of "whiptail" in cauliflowers.** *J. Dept. Agric. W. Aust.* 25 (S.S.) 1948 (412-418).

"Whiptail"—a Mo-deficiency disease of cauliflowers—has been observed on both acid and alkaline soils. It may be controlled by the use of commercial sodium molybdate containing about 45% of the effective salt applied at the rate of 2 lb./acre.

[1525] 635.62-1.5
SANKARAM, A. **The snake gourd in South India.** *Indian Farm.* 9, 1948 (457-458).

GEOGRAPHICAL

(4) EUROPE

(*See also* Abs. Nos. 1242, 1438, 1497, 1519)

[1526] (4)63
BACON, L. B.; HAINSWORTH, R. G.; JASNY, N. ET AL. **Agricultural geography of Europe and the Near East.** *U.S.D.A. Misc. Pub.* 665, 1948, pp. 67.

The best crop and livestock statistics available, as well as climatic data, have been compiled and presented graphically in such a manner that one may quickly visualize the effect of the combined physical forces on agricultural production and food supply for the people of the various countries discussed.

"This study shows the geographical origin of the food supply and other important agricultural products and indicates briefly the climatic, vegetation, and soil conditions that, to a considerable degree, account for the distribution of the crops and livestock in the European area."

[1527] (4)63
KOENIG, N. **Western Europe's blueprint for agriculture.** *Foreign Agric.* 13, 1949 (11-15).

The expansion of agricultural production in England, France, Switzerland, Sweden, Denmark and Germany during 1948 is described.

[1528] (411)619 : 631.811
DUNLOP, G. **Anoestrus in grazing animals due to nutritional causes.** *First Internat. Cong. Physiol. Pathol. Milan,* 1948 [W. Scot. Agric. Coll., Auchincruive]

Hill grazings over half the area of Scotland are deficient in P, and supplementary food high in P and containing essential trace elements increased the calf crop by 90%. Administration of 100 mg. of Co to ewes increased the number of early-born lambs.

[1529] (42)631.62
NICHOLSON, H. H. **Field drainage and increased production.** *J. Roy. Agric. Soc. England* 109, 1948 (212-221).

A review of the achievements of land drainage since 1939, with a survey of the development of field drainage in Britain and a discussion at present needs.

[1530] (43)631.416
GOY, S. Welche Nährstoffe braucht der Boden am notwendigsten? **[Which nutrient does the soil need most?]** *Z. PflErnähr. Düng.* 41, 1948 (207-212). [G.]

P is generally considered to be the first requirement for German soils; evidence is presented here to show the greater need for N. This is based on (1) Mitscherlich's data showing that the N : P : K ratios in natural soils 1.4 : 1 .1: 2.2, are about optimal; (2) Mitscherlich's law of the minimum which shows that yields fall away quickest when N is deficient; (3) Lemmermann's data of nutrient removal by crops, indicating that N is exhausted, or lost to soil, more quickly than P and K; (4) that yields have been boosted with inorganic N and that humus is declining due partly to the lack of organic manure.—K.S.

[1531] (43)634.9-1.4
EHWALD, E.; ERDMAN, G. **[Surveys in the Tornau forest.]** *Forst- u. Holzwirts.* 2, 1948 (107-111). B.A.BIII, 1949 (54).

Soil analyses are give in terms of particle-size distribution, pH, available CaO and mineral composition for mixed stands at 300-600 feet.

[1532] (43)634.9-1.44
GANSSEN, R. Versuch einer Gliederung deutscher Waldböden. **[A tentative classification of German forest soils.]** *Mitt. Reichsinst.Forst- u. Holzw.* No. 3, 1948, pp. 9. For. Abs. 10 (293). [G.e.f.sp.]

[1533] (437)63
BIELOGURSKAS, O.; GLICKMAN, D. L. **Reconstruction in Czechoslovakia.** *Econ. Rev. Food Agric.* 1, No. 1, 1948 (12-36).

[1534] (437)631.83
FOMIN, M. A. **Outlook for the development of a fertilizer industry from potassium salt deposits of the Carpathian foothills.** *Khim. Prom.* No. 5, 1947 (3-7). C.A. 43 (2742).

The most important salt in the Stebnik area is akinite-langbeinite. The main problem in treating the salt is the removal of silt and NaCl. By washing with cold water, dehydrating, filtering and drying at 900° a K-Mg salt is obtained giving a K_2O content of 70-75%.

[1535] (44)631.4 : 55
BORDAS, J. Contribution à l'étude des sols du Bas-Dauphiné. (Géologie et roches-mères). [**A study of the soils of the Bas-Dauphiné. (Geology and parent rocks).**] *Ann. Agron.* 19, 1949 (157-165). [F.]

[1536] (44)631.435.3 : 55
GRAINDOR, M. J. Les limons quarternaires aux environs de Rouen. [**Quarternary silts in the neighbourhood of Rouen.**] *Ann. Agron.* 18, 1948 (658-684). [F.]

Three sedimentation cycles which are given the name of periglacial cycles, or cycles which are influenced by the ice age, are distinguished in this area. The first one dates from the beginning of the ice age to its peak. During the second one loess deposits were laid down. This cycle was succeeded by an erosion cycle accompanied by the formation of loess. A distinction is made between the plateaux silts and the silts of slopes. The silts in the different districts are described in detail.

[1537] (44)631.615
BORDAS, J.; MATHIEU, G.; HUGUET, F. Étude des sols et mise en valeur des marais de Morestel. [**Study of the soils and reclamation of the Morestel marshes.**] *Ann. Agron.* 18, 1948 (641-658). [F.]

Survey of the soils of the Morestel marshes situated on the left bank of the Rhone not far from Lyons. Plans are discussed for the drainage and reclamation of these marshes and their cropping with suitable crops, taking into consideration the economic possibilities of the neighbouring towns of Lyons and Grenoble.

[1538] (44)633.18-1.5
PIACCO, R. [**Rice cultivation in the Bouches du Rhône.**] *Risicoltura* 36, 1948 (178-180). B.A.BIII, 1949 (8).

Progress in rice cultivation in the Carmargue district is described, and information given on climate, irrigation and cultural methods.

[1539] (45)63
GASPARINI, M. I problemi agronomici. [**Agronomic problems.**] *Ital. Agric.* 86, 1949 (107-124). [I.]

The Tuscan Maremma has a warm dry summer, with a cool, wet and changeable period between autumn and spring. In the plains the soils are predominantly alluvial, and their most frequent disadvantage is a high water table. In the fertile parts the outstanding problem is the regulation of soil water. It is suggested that fallows are unduly prevalent, and that agricultural and water-regulation practice should go hand in hand. Reclamation of formerly malarial land and settlement upon it should be accompanied by adoption of equally up-to-date agronomic methods.—R.N.

[1540] (45)63
TOFANI, M.; BELLUCCI, V. L'agricoltura maremmana nelle sue vicende storiche e nei suoi sviluppi. [**The agriculture of the Tuscan Maremma; its historical associations and present developments.**] *Ital. Agric.* 86, 1949 (84-106). [I.]

The Maremma is a littoral region of Tuscany about 50 miles wide. About 35% is forest (including sweet chestnuts, which are harvested), 40% under open arable crops, 14% under mixed cultivation of trees and arable, and about 10% cultivated pasture. Until about 1933, land improvement was almost entirely restricted to drainage, but since then more thorough-going schemes including planned settlement have been adopted. To-day the province of Grosseto includes some 80,000 ha. under reclamation projects in the coastal belt.—R.N.

[1541] (45)631.4

SCURTI, F. I terreni agrari del Piemonte quali risultano dallo "Studio chimico-agrario dei terreni italiani". **[Cultivated soils of the Piedmont as revealed by "Agricultural chemical studies of Italian soils".]** *Ann. Ist. Sper. Chim. Agrar. Torino* 16, 1946-1948 (9-32). [I.]

Part of a systematic 20-year-old investigation by the Turin Institute. A special note is devoted to the unproductive plateau soils called *baregge*. Whereas the lower parts of the plain are formed of recent alluvium, the *baregge* were laid down as alluvium from granite and porphyry in the Quaternary. The felspar of the *baregge* has undergone profound hydrolysis, most of its Ca and other nutrients have been removed and the Fe has been oxidized, resulting in the formation of an acid, heavy, impermeable soil. The undesirable characteristics of *baregge* soils have been modified under cultivation but are very marked in the large areas left uncultivated.—R.N.

[1542] (45)631.61

RAMADORO, A. Le bonifiche. **[Land reclamation.]** *Ital. Agric.* 86, 1949 (162-166). [I.]

In the Tuscan Maremma the maximum effect at comparatively small expense could be obtained by training the hinterland streams which have a torrential intermittent nature on account of the steep slopes and impermeability of the catchment basins. During autumn spates the rushing streams are apt to cause damage by forsaking their customary beds. Straightening of the water-courses, raising the banks, and especially removal of scrub vegetation and other clearing of the beds could be of great value; also the land should be used in such a manner as to increase infiltration and so reduce the intensity of spate. Provision of roads is indispensable to agricultural progress.—R.N.

[1543] (45)633.18-1.61

CHIAPPELLI, R. **[Land improvement in Baraggia.]** *Risicoltura* 36, 1948 (236-237). B.A.BIII, 1949 (101).

In the Baraggian irrigated region numerous embankments at different levels divide the land into small plots unsuitable for mechanical cultivation or rice growing. A scheme has been proposed for levelling and improving the land to render it more suitable for cultivation of rice.

[1544] (46)633.71-1.4

SEQUEIROS BORES, J. M. Algunas características agrologicas de las zonas tabaqueras españolas. Zonas 4a y 8a (provincias de Cáceres y Ávila). 2. Bases de cambio y capacidad de cambio de bases de estos suelos. **[Some agrological characteristics of the Spanish tobacco zones 4a and 8a. (Cáceres and Ávila provinces). 2. Exchangeable bases and base-exchange capacity of these soils.]** *Bol. Inst. Investig. Agron. Madrid* No. 19, 1948 (205-219). [Sp.e.f.]

The soils formed above gneiss and mica schists are 85.8-92.8% saturated and the alkaline-earth metals constitute more than 80% of the exchangeable cations. Those above granite are unsaturated, with unsaturated humus, and H provides 50% of the exchangeable cations. The alluvial soils from quartz and quartzose rocks are still higher in H. All the soils are poor in K, probably because of removal by tobacco and potatoes.

[1545] (47)631.812

VOLFKOVICH, S. I.; DUBOVITSKY, A. M. **[Technology of fertilizers and sulphuric acid in the U.S.S.R. in the last 30 years.]** *Zh. Priklad. Khim.* 20, 1947 (1053-1082). C.A. 43 (3156).

A review, with 93 references to Russian work.

[1546] (481)632.191 : 631.811.9

SORTEBERG, A. Mikronaeringsstoffmangelsykdommer på planter. **[Diseases of plants due to deficiency of trace elements.]** *Medd. Norske Myrselsk.* 46, 1948 (79-90). Field Crop Abs. 2 (36).

In Norway, liming increases the danger of B deficiency. When the soil was watered to only 20% of moisture capacity, B deficiency occurred more quickly and severely than when it was watered to 60% of its moisture capacity. Cu deficiency injures oats and barley, rarely injures wheat and very seldom rye. Carrots, turnips and swedes may suffer from lack of Cu. Mn deficiency injures oats; barley, wheat and rye are less severely attacked. Fe deficiency injures oats and barley. Without the addition to the soil of Zn, barley did not produce ripe grain and yield of straw was large.

[1547] (492)551.311.33
VINK, A. P. A. Bijdrage tot de kennis van loess en deksanden in het bijzonder van de Zuidoostelijke Veluwe. **[Contribution to the knowledge of loess and coversands, in particular of the southeastern "Veluwe".]** *Thesis, Wageningen* 1949, pp. 147. [Du.e.] [Agric. Univ. Wageningen]

An account of recent investigations in the "Veluweloess" region and the importance of these investigations for the general theory about loess and coversands. Some data from other countries and the soil map of "Middachten" and "Beerkhuizen" in the "Veluweloess" region are discussed.

[1548] (492)63
MUSGRAVE, G. W. **Notes on land use in Holland.** *J. Soil Water Conserv.* 4, 1949 (27-33). [U.S.D.A., S.C.S.]

The success of agriculture in Holland seems to be due to the fine balance which has been achieved between good management of soil, animals, water, nutrients and plants. Crops that are grown only on soils for which they are particularly adapted are a common feature of Dutch agriculture.

[1549] (492)631.459 : 551.55
LINDE, R. J. VAN DER Stuivende akkers in Nederland in 1947. **[Shifting soils in Holland during 1947.]** *Maandbl. Landb-VoorlD.* 5, 1948 (494-506). [Du.e.] [Inst. Toeg. Biol. Onderz. Nat. Oosterbeek]

Results of an official enquiry into the shifting of agricultural soils in Holland are described and mapped. Shifting occurred to a considerable extent in the peat areas and to a lesser degree in clay soils during a period of east winds in February, 1947. Later in the year shifting was severe on all exposed, unplanted sandy soils, but was less in land which had been cultivated for many years and treated with stable manure. No shifting was reported from wooded sandy soils or from those under pasture. During shifting, high dust clouds were observed, potatoes and young oat roots were exposed and seeds and fertilizers were blown away. Shifting only occurred during periods of intensive drought and strong winds and where there was no vegetation. Poor soil structure was conducive to shifting. It is recommended that the soil be left covered whenever possible, cultivation be carried out when the soil is not too loose, shelter belts be grown and adequate quantities of organic manures be applied.

[1550] (492)631.821 : 631.824 : 34
ROWAAN, P. A.; KLEERMAEKER, K. J. B. DE Kalk- en magnesiakalkmeststoffen. **[Lime and dolomitic amendments.]** *Maandbl. LandbVoorlD.* 5, 1948 (349-355). [Du.] [Landbouwproefst. Bodemk. Inst. T.N.O., Groningen; Rijkslandbouwproefst., Maastricht]

The new regulations concerning lime and magnesia amendments, brought into force on October 1, 1948, are discussed with reference to formulation and classification, stipulated requirements, amendment value and the most suitable forms for different soil types.

[1551] (492)631.86/7
KLEERMAEKER, K. J. B. DE; ROWAAN, P. A. Organische natuurlijke meststoffen. **[Organic natural manures.]** *Maandbl. LandbVoorlD.* 5, 1948 (567-570). [Du.]

A second Dutch Fertilizer Order dated October 1, 1948, includes the following types of composts in addition to the 3 manures (stable manure, cattle dung and human excrement) listed in the original control order of 1942: (1) ordinary compost made on farm or garden from plant residues; (2) composts from household and town refuse; (3) household-waste composts made by a fermentation process, and town wastes converted to sewage sludge and activated sludge; (4) house refuse composted with mud or slime; (5) leaf compost or leaf mould; (6) artificial manure made from straw with added chemicals; (7) activated sludge-peat composts; (8) soil composts, e.g., peat, turf, etc.—K.S.

[1552] (492)634-1.4
HULSHOF, H. J.; VELDHUIS, J. W. TE Bodem en fruitteelt in Oost-Gelderland. **[Soils and fruit farming in Eastern Guelderland.]** *Meded. Direct. Tuinb.* 12, 1949 (57-68). [Du.e.]

[1553] (497.1)631.4
ZLOKOVICH, B. **[Soil characteristics of the regions of Ultsin and Bar from the standpoint of their planned utilization.]** *Godish. Polopriv. Shum. Fac. Univ. Beograd* 1, 1948 (45-63). [Sb.r.]

[1554] (498)631.4
MAXIM, I. Contribuţiuni la studiul solului din regiunea Timişoarei. **[Contribution to the study of the soil of the Timişoara region.]** *An. Fac. Agron. Cluj 1946-1947*, 12, 1949 (247-274). [Rm.f.]

A complex mosaic of alluvial soils, "lacovishts" (wet grassland soils), rendzinas, red-brown forest soils, podzols and saline soils.

[1555] (498)631.416
VASILIU, A.; ONEA, T. Analize fiziologie-vegetale la soluri. **[Plant-physiological soil analyses.]** *An. Fac. Agron. Cluj 1946-1947*, 12, 1949 (275-280). [Rm.g.]

Analyses of four soils.

[1556] (498)631.445.3
ONEA, T. Contribuţiuni la studiul solului din câmpul de experienţă agrologia dela Facultatea de Agronomie Cluj. **[Contribution to the study of the soil of the experimental field of the Faculty of Agronomy, Cluj.]** *An. Fac. Agron. Cluj 1946-1947*, 12, 1949 (227-246). [Rm.f.]

Analytical data on a degraded red-brown forest soil.

(5) ASIA

(*See also* Abs. Nos. 1467, 1475)

[1557] (51)631.43
LI, L-Y.; LI, C-S. **[Certain physical characteristics of four soil types near Kushan, Foochow.]** *Fukien Agric. J.* 10, 1948 (59-68). [Ch.e.]

[1558] (51)631.459 : 551.55
LI, L-Y.; CHOU, C-Y. **[A preliminary survey of wind erosion with recommendations for soil protection on Haitan Island, Fukien.]** *Fukien Agric. J.* 10, 1948 (37-48). [Ch.e.]

[1559] (51)631.459 : 631.61
YEH, P. C. **A preliminary report on the study of soil conservation practices in the loess region of China.** *J. Agric. Assoc. China* No. 189, 1948 (7-20). [Ch.e.]

Run-off experiments were carried out on plots measuring 20 m. × 5 m. In 1947, the average run-off was 34,326.48 l./mow, i.e., about 1/10 of the annual precipitation and the average amount of soil eroded was 74.31 piculs/mow. The steepness of the slope affected the amount of soil eroded, but not run-off. Basin listing was the most effective soil-conservation measure for the eastern Kansu region ; broad-based terraces have also been tested. The practice recommended for the loess district is to put low dams across the terrace or contour ditches for every 3-5 ft. ; this would prevent 90% of the run-off and 95% of the soil erosion as compared with ordinary cultivation practices.

[1560] (52)63
SWANSON, C. L. W. **Land use and soil conservation in Japan.** *J. Soil Water Conserv.* 3, 1948 (159-164).

The farm land of Japan falls into two main groups (1) rice fields (irrigated) and (2) upland fields (unirrigated) devoted to other crops. Pastures are usually unimproved. High yields are obtained by heavy applications of fertilizers. Much of the irrigated land produces 2 crops yearly—rice in summer and wheat or barley in winter. The rice land has been carefully conserved, but much erosion has occurred on the uplands. Attention is now being given to reclamation of large areas for food production, but, in general, only poor land is available. "Labour is abundant, output per man is low, and though yields are high they would be made much higher by the application of modern farming technique and machinery."

[1561] (52)631.459 : 631.61
ALLO, A. V. **Control of soil erosion in Japan.** *N.Z. J. Agric.* 78, 1949 (251-256).

The basis of soil-erosion control in Japan is the maintenance of plant cover in the hills. Widespread deforestation occurred during the war, and many of the areas affected have not been replanted. Gully erosion is usually checked by some kind of stone dam. Terraces in Japan are built in the turf-and-seedling method of which there are many types ; the general principles are described. In another type of terracing crops are grown on the terraces instead of trees.

[1562] (54)63.001.89
SETHI, R. L.; CHATTERJEE, I. B. **Agricultural research : a review.** *Indian Farm.* 9, 1948 (441-446).

A review of the work of the Indian Council of Agricultural Research.

[1563] (54)631.459 : 631.61
CHHIBBER, H. L. **The reclamation of ravine lands of Jumna in the United Provinces.** *Nat. Geog. Soc. India* 1947, pp. 11. J. Sci. Indust. Res. India 6, 1947 (281).

[1564] (54)631.473
RAYCHAUDHURI, S. P.; MUKHERJEE, S. K. **Present position of soil survey in India.** *J. Sci. Indust. Res.* (*India*) 6B, 1947 (405-408). [Agric. Res. Inst., New Delhi]

A soil survey has never been undertaken, but scattered data have been collected by (a) land-assessment methods in which texture, colour, availability of water, level of land and yield of crops governed the system of land classification, and (b) a study of the soil from the geological point of view. A map of India showing the major climatic regions and the general distribution of soils on the basis of geological formations prepared by Wadia, Krishnan and Mukherji is reproduced. Surveys based on N, P and K content have been made, but these are unsuitable for soil classification on a physical basis. Surveys of clay, silt, soluble salts and less often of exchangeable bases have been made extensively in Sind and Punjab.

On the basis of existing data, the broad groups of red and lateritic soils, black soils, alluvial forest soils, desert soils and peaty and marshy soils can be recognized.

[1565] (54)631.67
MIRCHANDANI, R. T. **Irrigated farming with particular reference to Sind.** *Indian Farm.* 8, 1947 (501-503). [Karachi]

A general and popular discussion with paragraphs on the soils of Sind, water requirements of crops and *kalai* reclamation and prevention.

[1566] (54)631.875
ACHARYA, C. N. **Compost development in India.** *Foreign Agric.* 13, 1949 (16-18).

[1567] (54)632
VASUDEVA, R. S. **Soil-borne plant diseases and their control.** *Curr. Sci.* 18, 1949 (114-115).

Summary of an address to the Indian Science Congress in January, 1949. A general survey of the problem with reference to India.

[1568] (54)632.2
CHAKRAVARTI, R. **Eelworm diseases in plants.** *Indian Farm.* 9, (447-450).

An account of the most important plant diseases due to eelworms in India.

[1569] (54)633.51-1.5
GADKARI, P. D.; SIMLOTE, K. M. **Cotton cultivation in Central India and Rajputana. I. Cotton tracts and the crop.** *Indian Cott. Grow. Rev.* 3, 1949 (19-26). [Inst. Pl. Indust. Indore]

Climatological and agricultural characteristics of four areas.

[1570] (54)633.51-1.5
KHOORSID, A. B. H. **The cotton crop in Hyderabad State.** *Indian Cott. Grow. Rev.* 3, 1949 (27-39).

Climate, soil, cultivation.

[1571] (54)633.523
KUNDU, B. C. **Possibilities of increased production of jute in the Indian Union.** *Jute Bull.* Jan. 1948; *Indian Farm.* 9, 1948 (467-479).

A discussion on increased production of jute without decreasing the acreage under rice or other cereals used as foodstuffs. The measures suggested are increasing yields by manuring and increasing the acreage by the utilization of waste lands. Tables show the distribution of lands in West Bengal and the analysis of cultivable waste lands in the same region.

[1572] (54)635-1.5
DAS, B. K. **Cultivation of European vegetables in Digboi. (North-East Assam).** *Indian Farm.* 9, 1948 (501-507).

[1573] (56)631.416.2
KIRAÇ, A. N. Orta Anadoluda fosfor meselesi. **[The phosphorus problem in Central Anatolia.]** *T.C. Tarim Bakanl. Derg.* 3, No. 16, 1949 (11-20). [Tu.]

The soils of Central Anatolia are highly calcareous and have a high P content, but the latter is generally unavailable. Experiments carried out at the Dry Farming Station at Eskishehir between 1934 and 1945 have shown that for a certain variety of winter wheat the average yield over the 12 years has been raised from 1433 kg./ha. to 1902 kg./ha. by the application of 400 kg./ha.

of super. in alternate (fallow) years. A dressing of 250 kg. of ammonium sulphate by itself had no effect, but, in combination with super. raised the average yield to 2649 kg. Combinations of super. with dung gave the following results :—

	No super-phosphate	400 kg. super-phosphate
No dung	1433	1902
20 T. dung	2455	2633
60 T. dung	2700	2718

Different varieties of wheat showed different degrees of response. In the case of oats and maize, the response was considerably less.

No details are given as to method or time of application.—T.V.

[1574] (564.3)633.71-1.4

CORBETT, G. **Report on the Yellow Leaf tobacco industry and the possibility of cultivating Virginian tobacco in Cyprus.** *Govt. Printing Off. Nicosia, Cyprus* 1948, pp. 56.

In the arid northern coastal regions of Cyprus most of the tobacco is grown on terra-rossa and alluvial soils. Terra-rossa soils vary from loam to heavy clay loam with high Ca content. Uneroded soils are generally neutral, and eroded soils are alkaline with pH up to 7.5 The alluvial soils are generally heavy and alkaline with varying Ca content, and pH up to 7.5. All the soils have low humus content and are generally deficient in N and P. Excess Ca is detrimental to tobacco quality, and the best quality is produced on slightly acid soils. It is concluded that the production of a reasonable quality of Virginian tobacco in Cyprus is not possible without breeding suitable strains.

[1575] (569.1)631.47

TISSOT, P. Les régions agricoles du Liban. **[The agricultural regions of Lebanon.]** *Ann. Inst. Nat. Agron.* 35, 1948 (112-165). [F.]

Data are presented of precipitation, temperatures, winds, relief, vegetation, geology, soils, water problems, irrigation projects and crops.

[1576] (584)63

ANDERSON, G. W. **Agriculture in the undrained basin of Asia.** *Agric. Hist.* **22**, 1948 (233-238). [Univ. Minn.]

In Chinese Turkestan, agriculture is only possible in the oases, which comprise a little less than 1/75 of the total area. In the Russian zone there is a precarious equilibrium between precipitation and evaporation, and the region is semi-arid or complete desert. There are, however, vast stretches of steppe adaptable for growing certain grains, and fertile valleys in the mountains, while the deserts are covered by fertile river silt which is highly productive when irrigated. The temperature range is extreme.

In developing the place of Turkestan in Russian economy, the cultivation of cotton was of paramount importance. The natives were forced to limit themselves to this crop and new lands were opened as a result of extensive irrigation. After the accession of Nicholas II, the increasing numbers of Russian immigrants succeeded in raising rye, barley, wheat and potatoes in the Doab region. Later such fruits as peaches, apricots, grapes and pomegranates were grown, especially after the establishment of direct rail communication with European Russia. Rice culture was developed in Fergana where, owing to the contour of the terrain, the paddies could not be flooded permanently and water had to be carried periodically by irrigation canals. This prevented the penetration of water to the subsoil and diffusion of salt to the surface loess. The main consideration in Turkestan agriculture is the careful husbanding of water, which is supplied by large rivers and small streams fed by melting snows from the mountains. This has been achieved by an elaborate system of open and underground irrigation canals (*aryks* and *keriz*). Erosion by rapid currents in the *aryks* is prevented by a system of locks.

[1577] (59)633.18-1.5

HUET, G. La riziculture traditionelle en Cochinchine. **[Traditional rice cultivation in Cochin China.]** *Agron. Trop.* 4, 1949 (25-49). [F.]

The rice soils are described according to their agricultural characteristics. Healthy soils are defined as those containing neither toxic amounts of salt, sodium carbonate, other

alkali, or "alum" nor more than 10% of humus. Sodium chloride is toxic when its total amount exceeds 4 g./l. of aqueous solution of soil or water, particularly at the time of sowing, replanting and tasseling. Reclamation methods are noted. Irrigation and drainage canals and dykes and their layout are discussed and described with diagrams. Terraced rice fields are established on the slopes of hills and are also described with diagrams. A map showing the saline soils is included.

[1578] (59)633.523-1.81
ANGLADETTE, A. Le dévéloppement de la culture du jute en Indochine. [**The development of jute cultivation in Indochina.**] *Agron. Trop.* 3, 1948 (594-629). [F.]

Jute is an exhausting crop. The native usage is to apply farmyard manure, oil cakes, ashes and lime as basal manures and to supplement them during the development of the plant with localized applications of ashes or pig manure either in liquid or powdered form. In some districts oil cakes are used as supplementary manures.

[1579] (59)634.38-1.5
CARESCHE, I. La culture du murier en Indochine. [**Mulberry cultivation in Indochina.**] *Agron. Trop.* 4, 1949 (115-138). [F.]

[1580] • (593)63
FOOD AND AGRICULTURE ORGANIZATION. **Report of the F.A.O. Mission for Siam.** *F.A.O.* 1948, pp. 125.

[1581] (595)633.18
BARNETT, H. L. **Rice in Malaya. Season 1947-1948.** *Malay. Agric. J.* 32, 1949 (4-17).

Tabulated data on area planted and yields.

(6) AFRICA

(*See also* Abs. Nos. 1420, 1478)

[1582] (62)633.51-1.81
PANSE, V. G. **Cotton in Egypt.** *Indian Cott. Grow. Rev.* 3, 1949 (1-18).

A summary of observations made during a visit to Egypt. Egyptian varieties have a high spinning value, and the yield of 500 lb. lint/acre is the highest in the world. Some features of cotton cultivation are described. The average rate of application of fertilizers is one bag of Chilean nitrate equivalent to 34 lb. of N/acre in the Delta and twice this amount in Upper, i.e., Southern, Egypt. That still higher amounts may be applied profitably is apparent from experimental evidence.

[1583] (624)63
FERGUSON, H. **The Zande scheme.** *Emp. Cott. Grow. Rev.* 26, 1949 (109-121). [Min. Agric., Sudan]

A 30-year scheme is described for making the Zande people of the Sudan into a self-contained, wealthy peasantry growing cotton, oil palms and jaggery.

[1584] (678)63
SWYNNERTON, R. J. M. **Some problems of the Chagga on Kilimanjaro.** *E.Afric. Agric. J.* 14, 1949 (117-132). [Dept. Agric., Tanganyika]

Increasing density of population of the Chagga tribe on the fertile slopes of Kilimanjaro has resulted in investigations and recommendations on land tenure, irrigation, water control, redistribution of alienated and native lands and the development of underpopulated lowlands. These questions are discussed together with problems of climate, topography, ecology, soil erosion, stall feeding of cattle and tsetse fly.

[1585] (678)631.4
STOCKLEY, G. M. **Geology of North, West and Central Njombe District, Southern Highlands Province.** *Tanganyika Dept. Lands and Mines Geol. Div. Bull.* 18, 1948, pp. 70.

Contains short account of soils.

[1586] (689.7)633.72-1.81
WEBB, H. W. T. **Tea culture. Some notes on cultural practices at the Tea Experimental Station, Mlanje.** *Nyasaland Agric. Quart. J.* 8, 1949 (15-25).

The standard fertilizer application contains 50 lb. of N, 25 lb. of P_2O_5 and 12½ lb. of K_2O. $(NH_4)_2SO_4$ is preferred to other N fertilizers as it also controls tea yellows which is due to a S deficiency in Nyasaland tea soils. Cattle manure or compost is also used when available. Green manures have not been used, neither have shade trees. Bunding and terracing are practised as soil-conservation measures.

(7) NORTH AND CENTRAL AMERICA

[1587] (728.1)631.582 : 631.459
MIRANDA, M. O. Conservación de suelos en Guatemala. **[Soil conservation in Guatemala.]** *Campesino, Guatemala* 2, 1948 (22-24). Herb. Abs. 19(5).

An exposition of strip-cropping with special reference to conditions in Guatemala, where most lands have a slope of over 25%.

[1588] (729.4)631.445.73
BULLETIN OF IMPERIAL INSTITUTE. **Aluminous lateritic soil of Haiti.** *Bull. Imp. Inst.* 46, 1948 (386).

Aluminous lateritic soil containing as much as 50% alumina occurs in several areas of the Republic. Its average chemical composition is: Al_2O_3 46.8%; SiO_2 3.4; TiO_2 2.8; Fe_2O_3 21.9; P_2O_5 0.6; MnO_2 0.5; loss on ignition 24.1.

[1589] (729.8)631.459 : 631.61
BEYERING, J. Waterconservatie en erosiebestrijding op de Nederlandse Antillen. **[Water conservation and erosion control in the Dutch Antilles.]** *Landbouwk. Tijdschr.* 61, 1949 (209-214). [Du.]

Ground water is lacking for irrigation purposes in Curaçao and Aruba. A commission is investigating the economic possibility of a dam policy for conserving the very variable tropical rainfall in the conditions of difficult topography, high run-off and intense evaporation. Rainfall data are recorded for 1930-1946. Contour-damming is suggested for the flatter land.—K.S.

[1590] (73)631.44
ABLEITER, J. K. **Soil classification in the United States.** *Soil Sci.* 67, 1949 (183-191).

[1591] (74)631.432
HALBERG, H. N.; ROBERTS, C. M. **Recovery of ground-water supplies by pumping from water-table ponds.** *Trans. Amer. Geophys. Un.* 30, 1949 (283-292). [U.S. Geol. Surv., Boston, Mass. and Jamaica, N.Y.]

The paper summarizes a test-well study determine whether ground-water storage in glacial deposits near a water-table pond is available to augment local water supplies.

[1592] (75)631.824
HARDIN, L. J.; MACINTIRE, W. H. **Forsterite olivine formations of North Carolina as source of magnesium for fertilizers.** *J. Tenn. Acad. Sci.* 23, 1948 (180-186). B.A. BIII, 1949 (58).

Mixtures of superphosphate, olivine and serpentine containing 10% of water, after compacting and storing for 10 weeks at 30°, yielded fertilizers with a satisfactory content of available Mg.

[1593] (79)63
UPCHURCH, M. L. **Oregon's capacity to produce.** *Oregon Agric. Expt. Sta. Bull.* 459, 1948, pp. 20.

An appraisal of the agricultural resources of the State.

[1594] (79)631.44
POWERS, W. L.; TORGERSON, E. F.; DANNEN, E. V. **Identification and productivity of Western Oregon soil types.** *Oregon Agric. Expt. Sta. Circ.* 175, 1948, pp. 29.

[1595] (79)631.459 : 631.61
GRANT, B. S. **Erosion control in Los Angeles watersheds.** *J. Amer. Water Works Assoc.* 39, 1947 (1224-1228). B.A.BIII, 1949 (98).

Erosion in the Los Angeles watershed area and methods employed for controlling silting of reservoirs are described.

(8) SOUTH AMERICA

(*See also* Abs. No. 1274)

[1596] (81)631.415.7
VELOSO, H. P. Considerações gerais sôbre a vegetação do Estado de Goiás. **[General considerations concerning the vegetation of the State of Goiás.]** *Mem. Inst. Oswaldo Cruz* 46, 1948 (89-124). [Pt.e.]

The climatic, secondary and edaphic communities are discussed in some detail. The climatic community is of the *cerrado* type, as in much of São Paulo, Minas Geraes and Matto Grosso. Indicator plants include: *Vellozia compacta* which on the tablelands indicates soil unsuitable for agriculture; *Vochysia thyrsoidea* on breaks in the slopes indicates soil unsuitable for agriculture but suitable for forestry; associations dominated by *Gramineae* and *Cyperaceae* on the slopes of the table lands, soils unfit for arable farming but suitable for grazing; *Piptadenia macrocarpa* or *Bombax marginata*, calcareous

soils suitable for agriculture and forestry; the *cerrado* associations, deep soils useful for arable cultivation when irrigated and fertilized; *Mauritia vinifera*, soils requiring drainage.

[1597] (82)63 : 551.5
BOSSO, J. A.; BURGOS, J. J. Condiciónes agroclimáticas de la región de Carmen de Patagones. [**Agroclimatic conditions of the Carmen de Patagones region, Argentina.**] *Rev. Argent. Agron.* 15, 1948 (137-159). Field Crop Abs. 2 (74).

[1598] (82)631.4 : 552
POCOVI, A. S. [**The petrography of the soils in the province of Santa Fé.**] *An. Soc. Cient. Argentina* 144, 1947 (521-529, 623-675). C.A. 43 (2719).

A general introduction with a detailed description of the technique of granulometric analysis. The most important minerals are described.

[1599] (82)631.466.1
WINITZKY, J. Las especies de "Aspergillus" en muestras de tierra y aire de la ciudad de Buenos Aires. [**The species of Aspergillus in samples of soil and air from the city of Buenos Aires.**] *Rev. Investig. Agric. Buenos Aires* 2, 1948 (97-104). [Sp.]

It is intended to make a collection of *Aspergillus* species isolated from soil and air samples of the Argentine as a basis for study of their biochemical activities and possible economic use. 16 soil samples from 8 districts of the city and 192 Petri dishes exposed to the air in the same districts almost always contained *A. niger, A. terreus, A. fumigatus* and *A. flavus-oryzae* in this order of frequency. Species isolated from at least 3 districts included *A. versicolor, A. nidulans, A. ustus* and *A. ochraceus.*

(9) OCEANIA

(*See also* Abs. Nos. 1444, 1447)

[1600] (92)551.311.7
BAAK, J. A. De mineralogische samenstelling van enkele recente vulkanische assen van Java. [**The mineralogical composition of some recent volcanic ashes in Java.**] *Landbouw* 20, 1948 (269-274). [Du.]

The mechanical, mineralogical and chemical compositions of ash resulting from the eruption of Smeroe, Keloet and Merapi are presented.

[1601] (92)631.411.4
POLAK, B. Waarnemingen betreffende het gedrag van cultuurgewassen op veen. [**Observations on the behaviour of cultivated crops on marshes.**] *Landbouw* 20, 1948 (249-264). [Du.] [Alg. Proefst. Landb., Buitenzorg]

Literature on the cultivation of marsh soils in the Dutch East Indies is reviewed with reference to coconuts, rubber, oil palms, coffee, rice, pineapples, bananas, maize, cassava, sweet potatoes and sugar cane.

[1602] (92)633.18-1.5 : 33
GIESSEN, C. VAN DER Studiën over den rijstbouw op Java en Madoera. [**Studies on the cultivation of rice in Java and Madura.**] *Landbouw* 19, 1947 (289-322). [Du.]

The literature is reviewed with special reference to the economic aspects.

[1603] (92)633.887.791-1.5
HEETEREN, H. V. A. VAN Mogelijkheden voor de cultuur van pyrethrum (*Chrysanthemum cinerariaefolium* Vis.) op Java. [**The possibilities of cultivating pyrethrum (*Chrysanthemum cinerariaefolium* Vis.) in Java.**] *Landbouw* 20, 1948 (149-163). [Du.]

Subjects discussed include climatic and soil requirements. As the area of suitable land above 1800 m. is small, it is unlikely that large quantities of pyrethrum will be produced in Java.

[1604] (941)631.4
SMITH, R. **Soil types of the Margaret River district.** *J. Dept. Agric. W. Aust.* 25 1948 (426-437).

[1605] (942)631.473
NORTHCOTE, K. H.; TUCKER, B. M. **A soil survey of the Hundred of Seddon and part of the Hundred of MacGillivray, Kangaroo Island, South Australia.** *Aust. Counc. Sci. Indust. Res. Bull.* 233, 1948, pp. 91.

[1606] (943)631.62
SMITH, N. M. **Land drainage in the Moreton area.** *Cane Grow. Quart. Bull.* 12, 1949 (108-116).

Land drainage in this area is one of the principal factors in the maintenance of high production. The different drainage methods are described.

[1607] (943)631.62
SMITH, N. M. **The South Maroochy Swamp drainage scheme.** *Proc. Queensland Soc. Sug. Cane Tech.* 16, 1949 (149-154). [Bur. Sug. Expt. Sta., Nambour]

[1608] (943)633.492-1.5
HASSELL, O. **Sweet potato growing in Central Queensland.** *Queensland Agric. J.* 68, 1949 (1-15).

[1609] (945)631.459 : 551.55 : 631.61
THOMAS, R. G. **Soil drift control on Mallee farms. Seventh annual competition 1946-47.** *J. Dept. Agric. Victoria* 45, 1947 (549-556, 580-584).

[1610] (945)633.2.03-1.67
MORGAN, A. **Irrigated pastures in Victoria.** *J. Dept. Agric. Victoria* 47, 1949 (97-105).
Account of research at the State Research Farm, Werrikee, started in 1914. Victoria had in 1946-47 326,822 acres of irrigated pastures.

[1611] (945)633.2.03-1.855
COMMONWEALTH AGRICULTURIST. **Maintaining the pastures. Management suggestions.** *Commonw. Agricst.* 18, 1948 (104-108). Herb. Abs. 19 (19).
The recovery of sown pastures treated with super. after two drought seasons in Victoria and the Riverina is demonstrated. An annual application of at least 1 cwt. of super. is recommended as economic. Seed mixtures are suggested for different soil types.

[1612] (951)631.4
BEUSECHEM, D. VAN Korte bijdrage tot de kennis van de bodemgesteldheid en de landbouwkundige waarde van een veertiental geëxploreerde gebieden in Nederlands Nieuw-Guinea. **[Short account of the known soil conditions and agricultural value of fourteen districts of Dutch New Guinea.]** *Landbouw* 20, 1948 (210-229). [Du.] [Alg. Proefst. Landb. Buitenzorg]

RECENT BOOKS

546.56 : 63 COPPER DEVELOPMENT ASSOCIATION.
Copper Compounds in Agriculture and Industrial Microbiology. Copper Development Association, London. 1948. Pp. 117. Gratis.

551.48 : 551.577 FOSTER, E. E.
Rainfall and Runoff. MacMillan Company, New York. 1948. Pp. 487. $9.00.

577.17 PEARSE, H. L.
Growth Substances and their Practical Importance in Horticulture. Commonwealth Bureau of Horticulture and Plantation Crops. Technical Communication No. 20, 1948, pp. 233. 12s. 6d.

631.452 : 149.918.6 PFEIFFER, E.
Soil Fertility, Renewal and Preservation. Faber and Faber, London. 1947. Pp. 196. 12s. 6d.

631.459 : 631.61 TEMPANY, SIR H. A.
The Practice of Soil Conservation in the British Colonial Empire. Commonwealth Bureau of Soil Science. Technical Communication No. 45. 1949. Pp. 106. 10s. 0d.

631.46 POCHON, J.; TCHAN, Y. T.
Précis de Microbiologie du Sol—Principes, Techniques, Place dans les Cycles Géobiologiques. [Summary of Soil-microbiology—Principles, Techniques, Place in Geobiological Cycles.] Masson et Cie., Paris. 1948. Pp. 222. [Monographies de l'Institut Pasteur]

(492)63 MALTHA, D. J.; OORTHUYS, C.
Agriculture in the Netherlands. Contact Publishing Company, Amsterdam. Pp. 37 + 144.

(73)631.459 : 631.61 GUSTAFSON, ET AL.
Conservation in the United States. Comstock Pub. Co. Ithaca, N.Y. 3rd Ed., 1949. Pp. 534. $5.

INDEX TO AUTHORS

SOILS AND FERTILIZERS

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GLEYING

by

C. Bloomfield

The term "gley" is popularly understood in Russia to refer to a sticky material which is frequently coloured light greenish-blue. The introduction of the term into scientific literature appears to be due to Vysotzky (1905).

Gley formation is found in marshes and under conditions of high water table; the gley horizon is generally waterlogged, except when the water table recedes.

Zavalishin (1928) describes a typical gleyed horizon as "... of a light grey or grey colour with a bluish, blue or sky-blue tinge. The colour is not uniform, it depends on the intensity of gleying and on the mechanical composition of the material. Usually the grey-blue background is mottled with large red spots and veins. These spots, found more frequently with clays, are associated with cracks and root paths. ... When the gleying is very strong, the material is of a homogeneous grey-blue coloration without any spots or veins. Gley horizons, especially sandy, at times resemble podzols; the bluish tinge and the red spots identify it, however, as gley."

Under the anaerobic conditions produced in a waterlogged soil ferric iron is reduced to the ferrous state: the colour of the gleyed horizon, which has been variously described as blue, blue-grey, grey and green, is commonly ascribed to the presence of ferrous compounds such as vivianite and ferrous sulphide.

While the formation of vivianite does not appear to be a common occurrence, ferrous sulphide is frequently found and is produced by the action of hydrogen sulphide resulting from the microbiological reduction of sulphates. This process has been extensively studied in connexion with the corrosion of buried steel work (Starkey and Wight, 1945, give a useful review of this subject). When present in a gleyed soil, ferrous sulphide tends to occur in isolated pockets which are dark-blue or black in colour; exposure to air causes rapid oxidation with the production of rust-coloured areas.

Zavalishin, who made an extensive study of soils with gleyed horizons in the podzol zone, found that the soil becomes less acid with depth and reaches neutrality in the gleyed horizons. While there is little organic matter in the gley horizon, the amount of soluble humus increases with depth and is higher in the G horizon than in the overlying A horizon, although this has a higher total of organic material. The gley horizon differs but little from the parent material except that it contains slightly less calcium. In the G horizon magnesium is retained more tenaciously than calcium; in the other horizons the magnesium content is lower than that of the calcium.

Although it is only comparatively recently that attention has been directed to the mechanism of the reduction process taking place when a soil is gleyed, the early literature contains observations having a definite bearing on the question. Thus Kindler (1836) observed the solution of iron around plant roots, in ferruginous sand, and Winogradsky (1888) used anaerobic conditions to obtain ferrous solutions for use in his experiments on iron bacteria. Lieske (1912) found that ferric iron was reduced to the ferrous state during the growth of certain moulds.

Wright (1922) investigated the dissolution of minerals in fermenting sugar solutions, and concluded that the action was solely due to the production of acids.

Gruner (1922) obtained interesting results in his work on the removal of iron from minerals by peat solutions. Unfortunately it is not clear what part, if any, was played by micro-organisms.

Halvorson and Starkey (1927) have studied the solution, precipitation, oxidation and reduction of iron in the soil, specifically in connexion with microbial action. They derived a relationship, based on the Mass Law, connecting oxygen pressure and pH with the amount of ferric and ferrous iron in solution, and studied the effects of mixed cultures of soil micro-organisms on the dissolution and precipitation of iron. They found that precipitation did not invariably result from the oxidation of solutions obtained by anaerobic incubation; exhaustion of organic "anions" by continued microbial growth was shown to be a possible cause of precipitation.

Robinson (1930) studied the soil solutions produced under submerged conditions and found that in the absence of organic matter the solubilities of iron, magnesium, calcium and manganese were not increased. Soil solutions from old and recent bogs were not particularly high in iron or manganese, presumably owing to their removal by leaching, but their concentrations in bog waters were considerably higher than in ordinary drainage waters. Prolonged submersion caused considerable increases in the amounts of dissolved potassium and sodium, but the concentration of dissolved alumina did not change significantly.

Albrecht (1941) discussed the role of calcium saturation and anaerobic bacteria as factors in the production of gley soils. Acid clays were gleyed on incubation after treatment with lime or magnesia, but not when treated only with alumina or potash. Albrecht suggested that the horizons above that of gley formation possess insufficient calcium for microbial activity to occur, so that percolating organic matter is not utilized until it has moved down to a horizon of sufficient calcium content.

Ignatieff (1937, 1941) developed a colorimetric method for the determination of ferrous iron in soils using a 2 per cent solution of aluminium chloride for extraction. He found that exposure of the extracts to daylight caused a considerable increase in the ferrous-iron content. By analogy with the photochemical reduction of e.g. ferric oxalate, this suggests the presence of ferric complexes in the extracts. In view of the enhanced stability to oxidation of the ferrous iron that he observed in the presence of the aluminium chloride, Ignatieff tentatively suggested that the movement of iron in the soil occurs in the ferrous condition and in association with aluminium compounds.

A biological method for the removal of ferric oxide from soil material, by anaerobic incubation in a sugar solution, has been described by Allison and Scarseth (1942). The fact that the micro-organisms present in non-gleyed soil material were apparently capable of effecting removal of iron without inoculation with gleyed material, suggests that the micro-organisms responsible must be very numerous and widespread in the soil. Allison and Scarseth remark on the connexion between this process and those of gleying and podzolization.

Roberts (1947) studied the ability to reduce ferric iron of nearly 300 micro-organisms, including yeasts, actinomycetes and bacteria. None of these were found to be effective, except seven strains of *B. Polymyxa* which he isolated from soil; cultures of *B. Polymyxa* obtained from the America Type Culture Collection were ineffective.

Bloomfield (1949) has studied the solution of iron under conditions similar to those used by Allison and Scarseth. He found that to produce gleying in a non-gleyed soil it was often necessary to inoculate with suspensions of gleyed material. The rate of the reduction of ferric iron was greater when calcium carbonate was added, although the intensity was less, as measured by the amount of ferrous iron in solution. This decreased intensity did not appear to be explained by a pH effect as the addition of the carbonate had a comparatively slight effect on the final pH of the system. The fermented solutions did not always give precipitates on oxidation; at the observed pH values the retention of ferric iron in solution suggested that it was present in complex combination. He suggested that, apart from the production of sulphide and possibly phosphate, the chief factor involved in the colour produced on gleying is the removal of the amorphous ferric oxide that masked the original colour of the clay.

Valuable reviews of the Russian literature on gleying are given by Joffe (1935, 1936).

REFERENCES

Albrecht, W. A. (1941). *Soil Sci.*, 51, 213.

Allison, L. E. and Scarseth, G. D. (1942). *J. Amer. Soc. Agron.* 34, 616.

Bloomfield, C. (1949). In the press.

Gruner, J. W. (1922). *Econ. Geol.* 17, 407.

Halvorson, H. O. and Starkey, R. L. (1927). *J. Phys. Chem.* 31, 626. (1927) *Soil Sci.* 24, 381.

Ignatieff, V. (1937). *Jour. Soc. Chem. Ind.* 56, 407; (1941) *Soil Sci.* 51, 249.

Joffe. J. S. (1935). *Soil Sci.* 39, 391; (1936) *"Pedology"*. Rutgers Univ. Press.

Kindler, A. (1836). *Pogg. Ann. Phys. Chem.* 37, 203.

Lieske, R. (1912). *Jakrb. Wiss. Bot.* 50, 328.

Roberts, J. L. (1947). *Soil Sci.* 63. 135.

Robinson, W. O. (1930). *Soil Sci.* 30, 197.

Starkey, R. L. and Wight, K. M. (1945). Anaerobic Corrosion of Iron in Soil. Final report *Amer. Gas Ass., Iron Corr. Res. Fellowship, Amer. Gas Ass., New York.*

Vysotzky, G. N. (1905). Cited in *"Pedology"*, by J. S. Joffe.

Winogradsky, S. (1888). *Bot. Ztg.* 46, 262.

Wright, D. (1922). *Univ. Calif. Pub. Agric. Sci.* 4, 245.

Zavalishin, A. A. (1928). Cited in *"Pedology"*, by J. S. Joffe.

SOIL FERTILITY AND SEWAGE

(*Soil Fertility and Sewage. By J. P. van Vuren. Faber and Faber, London.* 1949. *Pp.* 236. *Price* 18*s.* od.)

Reformers who are concerned by the vast quantities of waste material produced by urban centres that have to be disposed of regularly and often at great expense have frequently advocated the composting of the remains of what has not been eaten with the remains of what has been eaten—in other words, of household refuse with night soil or sewage. In this way a considerable proportion of the plant nutrients consumed in towns would get returned to the soil. Mr. van Vuren, who describes in this book the remarkable efforts he has made to introduce this kind of composting into South African townships, estimates that the human excrement produced in the towns is equivalent annually to 35,621 tons of nitrate of soda, 7,222 tons of superphosphate and 2,500 tons of potash.

Many of the smaller South African towns appear not to have water-borne sewage, and the disposal of night soil is a municipal problem of some magnitude. Mr. van Vuren started a scheme for composting urban wastes with night soil at the small town of Ficksburg in 1939, and three years later, during the war, was appointed co-ordinating officer of a national urban compost campaign, the purpose of which was to enlarge the greatly restricted supply of fertilizer material then available. The campaign met with a remarkable response, and at the present time one-third of the Union's urban centres, embracing two-thirds of the total urban population, have composting schemes. Besides these municipal schemes many others have been started by private enterprise, and a public company "African Organic Fertilizers and Associated Industries, Ltd." with a capital of about £400,000 has been floated to (among other things) "manufacture organic soil food" on a large scale.

The most important part of the book describes how methods were developed and experiments were made for preparing compost as hygienically and economically as possible. A serious problem was to prevent excessive fly-breeding in the compost pits, and this could be done by frequent turning while a high temperature was maintained in the centre of the pit. Ultimately a satisfactory-looking and inoffensively smelling compost was produced at a cost of 7s. od. a cubic yard of sieved manure, which was sold at 10s. 6d. An essential feature of the method is regular and frequent turning of the compost material, and it might not be economic in places where labour costs are high.

While there is everything in favour of the principles of returning to the land as much as possible of what is taken out of it (and most of this does find its way to the towns), whether or not the principle is adopted will be determined, in this imperfect world, mainly by economic factors. On this the book has very little to say, although it is admitted that farmers may object to payin;

freight on 75 tons of water when they buy 100 tons of manure. Figures are given of the composition of various composting materials, of the nutrient content and monetary value of urban residues and sewages, of the bacterial content of organic manures and so on, but nowhere is the actual composition of the finished South African product given nor what effect it has on crop yields. Both these omissions are regrettable. Urban-refuse composts vary tremendously in composition and efficacy from season to season as well as from place to place. In Britain, for example, the fertilizer value of household refuse fell to a negligible figure during the war as a result of the anti-waste campaign. Nice looks and smell are not criteria of a good compost. Mr. van Vuren lays particular emphasis on the value of compost in supplying organic matter to the soil, but organic matter alone, without NPK and increased yields, will not balance the farmers' books.

SUMMARY OF REPORTS

Reports received include: *Australia*, Western Australia, Report of Government Chemical Laboratories 1946; Report of the Forests Commission of Victoria 1947-48; *Barbados*, Report of Department of Science and Agriculture 1947-48; *Belgium*, Station Provinciale des Recherches Scientifiques de Viticulture, à la Hulpe, Rapport 1948; *Canada*, Report of the Research Council of Alberta 1948; Dominion Experimental Station, Charlottetown, P.E.I., Progress Report 1937-47; *Ceylon*, Report of the Director of Agriculture 1947; *Colonial Office*, Colonial Annual Reports 1948 for New Hebrides, St. Lucia and Seychelles; *Cyprus*, Investigations and Developments in Cyprus Agriculture 1938-48; *Empire Cotton Growing Corporation*, Progress Reports from Experiment Stations 1947-48 and Programmes of Experiments 1948-49; Report of the *Forestry Commissioners*, London 1947-48; Report of the *John Innes Horticultural Institution* 1948; Report of the Council of the National Farmers' Union 1948; *Hawaiian Sugar Planters' Association*, Report of Annual Meeting December 1948; *Indore*, Report of the Institute of Plant Industry 1947-48; Report on Agriculture in *Malaya* 1947; Agricultural Research Institute *Northern Ireland*, Report 1947-48; Report of the Department of Agriculture for *Scotland* 1939-48; *Macaulay Institute* for Soil Research, Scotland, Report 1947-48; *South Africa*, Council for Scientific and Industrial Research, Report 1947-48; University of Natal, *Wattle Research Institute* Report 1948; *Southern Rhodesia* Report of National Resources Board 1948; Annuaire Agricole de *la Suisse* 1949; *West Africa* Cacao Research Institute Report 1947-48; *United States Experiment Stations*. *Minnesota* 1946-47; *Purdue* 1947-48.

Western Australia.—*Government Chemical Laboratories*.—Fertilizers for irrigated pastures, grapes and tomatoes. $ZnSO_4$ for die-back in flax. Composting of straw. Study of soils from areas connected with sheep-infertility investigations. Study of laterite profiles.

Barbados.—Determination of exchangeable K in various soil types. Manurial trials with NPK, $(NH_4)_2SO_4$ and NP on sugar-cane soils and their effect on sucrose content of juice.

Canada.—*Alberta*.—Irrigation soil surveys. International soil survey of Saskatchewan, Alberta, British Columbia, Idaho and Montana for correlation of classification of grey wooded and mountain soils.

Dominion Experimental Station, Charlottetown.—Intensive potato growing; fertilizers and lime, rotations and continuous cropping; methods of applying barnyard manure. Grass mulching for fruit trees. Fertilizers for pastures; chemical fertilizers as supplement to farmyard manure, N fertilizers for hay. Effect of ground limestone on farm crops. Low drought resistance of soils and drainage.

Ceylon.—Wilt of *Cinchona* due to physical condition of the soil. Disinfection of soil with 10 per cent solution of Brunolinum plantarium for control of *Sclerotium* disease of Jak. Dying out of cacao growing under balsa on soil of poor water-holding capacity. Studies on availability and fixation of P_2O_5

in Ceylon soils. Correlation between the amount of crumbs and stability of crumbs in several soils; changes in crumb structure as a result of chena cultivation. Rate of movement of salts in Ceylon soils. S applied at 4 tons/acre to saline calcareous soils increased the rate of percolation 20-fold in 3 months; 1 ton/acre of S and 4 tons of gypsum improved percolation 10-fold on a sticky, heavy soil. Fertilizers for tea, coconuts, rubber, maize, paddy, citronella, pawpaw and pastures. Rotations and ley farming for paddy.

Cyprus.—N and P fertilizers and green manures for wheat. Effect on wheat of fallow in alternate years, and grass leys and hay in rotation. Organic-matter content of Cyprus soils and improvement of humus content with compost, sheep manure + super. and NPK. Bone meal as fertilizer. Soil classification. Trace-element deficiency, especially Fe and Zn in citrus and Fe and Mn in apples.

Empire Cotton Growing Corporation.—*Biloela, Queensland.*—Trials with mechanical harvesting of cotton. Time and rate of spray irrigation. Combined varietal and rotation experiments. Studies relating to moisture and nitrate content due to various types of cultivations.

Barberton, South Africa.—Cotton rotations with maize.

Gatooma, S. Rhodesia.—Effect of compost on cotton yield and on succeeding maize. Negative effect of KCl on cotton yield. Rotation of cotton with maize and grass. Comparison of cotton planted on ridges and on the flat. Pre-planting cultivation treatments and the maize crop. Applications of DDT in liquid form increased seed cotton yields.

Kawanda, Uganda.—Trials with $(NH_4)_2SO_4$ and rock phosphate. Yields on land newly opened from grass ley were not high; where cotton is planted too soon after opening, there may be a temporary N deficiency. There was significant response to N on land newly opened from elephant grass. Ridge cultivation in a year of poor second rains contributed to high yields.

Lake Province, Tanganyika Territory.—Land-resting trials; continuous cultivation compared with cropping after elephant grass, pigeon pea and weedy cassava. Residual effect of farmyard manure, compost and NPK. Comparison of methods of planting; splitting the ridges, tied and not-tied ridges, and flat cultivation.

Domira Bay, Nyasaland.—Resting-crop experiments. Mixed cropping with cotton and maize. Rotations with maize, groundnuts and sorghum.

Leeward Islands.—Comparison of common-weed fallow with clean fallow and cultivation of catch crops and green manure. Rotations with elephant grass. Use of pen manure and artificial fertilizers.

Antigua.—Residual effect of pen manure and NPK on maize. Time of application of $(NH_4)_2SO_4$. Rotations with elephant grass, green manure, weed fallow, bare fallow and maize. Soil-moisture determinations. Soil rehabilitation on hilly land.

St. Vincent.—Rotations with catch crops, green manure, fallow, maize, sweet potatoes and peas.

John Innes Horticultural Institution.—Preparation of composts. Method of mixing sterilized loam with compost. Comparison of growth of tomato and cauliflower in clay pots and soil blocks.

Hawaiian Sugar Planters' Association.—Single and split application of N for sugarcane; depth of N placement. Sources of N and P. Soil fumigation with DD. Influence of soil type and amount of water on action of 2,4-D. Cane injury by excessive 2,4-D. Effect of 2,4-D on soil organisms.

Institute of Plant Industry, Indore.—Trials with graded doses of N and P. Comparison of leguminous crops preceding cotton and such crops receiving P manure. Fertilizer trials on juar seed, groundnuts, gram, linseed and wheat. Residual effect on the succeeding kharif crops of manurial treatment given to rabi crops.

Malaya.—Use of mechanical equipment on wet and dry padi and groundnuts. Inter-row mechanical cultivation of oil palms. Effect of increasing applications of N to tea. DD as soil fumigant in tea areas. Mulching of coffee. Continuous-cropping experiments with maize on yellow quartzite soil receiving organic and inorganic fertilizers. Reclamation of old mining lands for cultivation of maize, ragi, soybeans and tomatoes. Toxic effect on padi of As in mining slimes.

Scotland, Department of Agriculture—The food-production campaign and control of lime and fertilizers 1939-45. Post-war policy 1945-48.

Macaulay Institute.—Survey of parent materials and soils in suspected areas of pining in sheep in S.W. Scotland, due to Co deficiency. Mineralogical examination of fine-sand fractions of soils and their parent materials for the determination of soil associations. Study of clay material formed from decomposed granite. X-ray study of mineralogy of clay fractions in soils. Design and construction of X-ray camera for clay mineralogical work. Study of soil clays of N.E. Scotland and of decomposition of biotite by natural processes. Study of vermiculites. Differential thermal analysis of soil clays. Spectro-chemical study of trace constituents in soil, plants and biological materials. The chemistry and chemical properties of humus. Nature of the more complex N compounds in soils. Bacteriological and mycological investigations of soil and soil-plant problems of composting. Examination of a technique for distinguishing between mycelium and spores in soil by subjecting soil to vacuum desiccation. Utilization of peats. Investigations into changes in soil when forest canopy is being formed. Laboratory and field work on use of plants in assessing soil conditions. Methods of assessing nutrient requirements of soils and crops and of increasing effectiveness of fertilizers. Effect of soil type on lime and fertilizer needs of soils and on their crop-producing capacities. Effect of farmyard manure on responses to N, P and K individually and in combination. Investigations on P fixation with reference to (1) interaction of $CaCO_3$ and $CaSO_4$ with P on different soil associations, (2) comparison of infrequent heavy and frequent light dressings of P and (3) use of fertilizers in powder and granular forms. Fertilizer-placement studies on cereals, turnips and swedes; combine-drilling of $(NH_4)_2SO_4$ does not affect response to combine-drill applications of super. There is little difference between combine-drilling and broadcasting of K.

United States Experiment Stations

Purdue University.—Influence of soybeans on soil conditions and growth of subsequent legume crops; response of soybeans to super., rock phosphate and N; effects of fertility level and soil type on growth, production and composition of soybeans; response of soybeans to various rates of fertilizer ploughed under. Nutrient requirement of crops grown on muck soils. Effect of water level in muck soils on physical character of soils. S levels of Indiana soils and rate of natural replacement; effect of S on availability of plant nutrients. Revegetation of coal-mine spoil banks. Effects of soil micro-organisms and soil organic matter on soil productivity. Condensation and absorption of water as a source of soil moisture. Addition of Al salts to muck soils for control of potato scab.

ABSTRACT SECTION

NOTE.—A capital letter in square brackets following the reference denotes the language in which the paper is written. A small letter denotes a summary in another language, e.g. [G.e.]—German, with English summary. English [E.] is only indicated for papers published in journals usually written in foreign languages. Where the Bureau has only seen an abstract, and not the original paper, no language indication is given.

Original (untranslated) titles of papers are only given where the Latin script is used.

Where more than one reference is given, the first is to the original paper, the others to notices in abstract journals. A key to the abbreviations used in the references is contained in the Bureau's *Bibliography of Soil Science, Fertilizers and General Agronomy*.

631.3 AGRICULTURAL EQUIPMENT

[1613] 631.312
BROWN, D. T. **A new plough for Indian cultivators.** *Curr. Sci.* 18, 1949 (180).

A new double Desi plough designed by the Indian Agricultural Research Institute is described. It can be drawn by a single pair of bullocks and ploughs 4½-5 inches deep.

[1614] 631.312.5
FARM MECHANIZATION. **Australian stubble mulcher.** *Farm Mech.* 3, 1949 (136).

The mulcher incorporates an orthodox Australian type of tined cultivator onto which a straw-cleaning mechanism, consisting of reciprocating rakes, is mounted together with a seedbox. The land can be cultivated and sown in one operation, leaving all crop residues on the surface.

[1615] 631.333
AGRICULTURAL ENGINEERING RECORD. **A top-delivery fertilizer distributor.** *Agric. Engng. Rec.* 2, 1949 (212-213).

A machine devised by the National Institute of Agricultural Engineering is described.

[1616] 631.333
AGRICULTURAL ENGINEERING RECORD. **James Junior lime and fertilizer distributor.** *Agric. Engng. Rec.* 2, 1949 (221).

[1617] 631.333
FERTILIZER AND FEEDING STUFFS JOURNAL. **New fertilizer distributor.** *Fert. Feed. J.* 35, 1949 (343-344).

A new "Glostrac" fertilizer distributor can handle damp or caked fertilizers without difficulty. The hopper holding 4-5 cwt. has a worm-screw crusher which breaks up lumps and forces the fertilizer through an adjustable slide opening on to a revolving spinning wheel. The distributor is 4 feet wide and high and can be drawn by tractor or lorry. Dressings of ½ cwt./acre or more can be broadcast, irrespective of the speed of the tractor. The width of spread obtainable can be varied between 6 feet and 20 feet.

631.4 SOILS

[1618] 631.4
CROWTHER, E. M. **Soils and fertilizers.** *J. Roy. Agric. Soc. England* 109,1948 (71-81).

Publications are reviewed on soil conservation and saline soils, and the spectrographic and other methods of analysis of soils and plants, supplies of fertilizer, radio-isotopes and the Commonwealth Agricultural Bureaux Conference on Tropical and Sub-tropical Soils are discussed.

[1619] 631.4 : 539.16
TRENER, G. B.; SCARAMUCCI, M. A. **Soil radioactivity of the surroundings of Merano and of Lurisia** [Cuneo]. *Ricerca Sci.* 18, 1948 (756-760). B.A.AI, 1949 (75).

In both regions, sub-soil radioactivity is low (0.3mμC./l.), but at Lurisia values of 1-2mμC./l. are observed near autunite deposits. At Merano many springs have high emanation content of 30-180mμC./l. The geological structure of each region is described and the origin of the radioactivity discussed.

[1620] 631.4 : 549.1
JEFFRIES, C. D.; JACKSON, M. L. **Mineralogical analysis of soils.** *Soil Sci.* 68, 194 (57-73). [Penn. St. Coll. and Univ. Wis

[1621] 631.4 : 638.16
SMELLIE, E. **Influence of climate and soil types on nectar secretion.** *N.Z. J. Agric.* 78, 1949 (397-399). [Dept. Agric., Christchurch]

The nectar of a species of plant may differ in character and quantity according to the soil and other environmental factors influencing plant growth. Medium to good land can withstand drought for much longer than lighter soils and drains more freely than the heavy soils, and is more reliable for honey production. Lighter soils sometimes give more reliable yields than heavy soils. Canterbury beekeepers receive 95% of their honey from pasture land; undulating grassland is fairly consistent for honey production, but honey yields are best from medium to good cropping soils overlying shingle and sand formations on the plains.

631.41 SOIL CHEMISTRY

(*See also* Abs. Nos. 1746, 1752, 1893, 1927, 1928, 1977)

[1622] 631.413.1 : 631.432.21
SMITH, R. M.; BROWNING, D. R. **The influence of drying on soil buffering in relation to aggregation and other factors.** *J. Agric. Res.* 78, 1949 (263-284). [U.S.S.C.S. and W. Va. Agric. Expt. Sta.]

Oven-drying increases acidity as compared with moist or air-dried soils. The effect is most pronounced when freshly added bases are involved, but is also evident in soils leached free of bases. Alternate soaking and drying has little more effect than a single drying. When no new bases are added the pH usually returns to the original value in 30 days or less. Grinding after drying increased the pH of subsoil clay and reduced that of high-organic surface soil. Crushing in the early stages of drying lowered the pH more than when crushing was delayed until after prolonged drying.

The drying effect may help to reconcile some apparent contradictions of methods and results in the literature. The fact that aggregation and acidity are both increased by drying suggests that the drawing-together of colloidal surfaces may be the fundamental cause of both phenomena.

[1623] 631.414.2 : 549.67
GUTIERREZ RIOS, E.; GONZALEZ GARCIA, F. Sobre la serie isomorfa, montmorillonita-beidellita. **[The isomorphous series montmorillonite-beidellite.]** *An. Inst. Esp. Edafol.* 7, 1948 (605-621). [Sp.e.f.]

From the chemical composition of 17 samples of pure bentonite from Spanish Morocco, the mineralogical formulae have been determined by Ross and Hendricks's method. The samples are terms of the montmorillonite-bentonite series and their characteristics coincide with those of the group of 54 samples studied by Ross and Hendricks. Six of the samples show the maximum replacement of Si^4 by Al^3 foreseen by the above-mentioned authors and of which no representative had previously been found. Their formula is:

$$[Al^{3}_{2\cdot22}][Al^{3}_{1}+Si^{4}_{3}]O_{10}(OH)_2 \cdot X_{0\cdot33}$$

[1624] 631.414.2 : 631.435
ALEIXANDRE FERRANDIS, V.; GARCIA VICENTE, J. La variación de las propriedades fisico-quimicas de las arcillas con el tamaño de grano.(I). **[The variation with grain size of the physico-chemical properties of clays. (1).]** *An. Inst. Esp. Edafol.* 7, 1948 (529-604). [Sp.e.]

The fractions of radius 1 - 0.6 μ, 0.6 - 0.4 μ and < 0.4 μ were extracted from a siliceous skeletal soil containing $CaCO_3$, red soils, grey soils and a podzolized grey soil. With increasing particle size there was an enrichment of products more resistant to leaching, e.g., SiO_2 and TiO_2, an increase of the $SiO_2 : R_2O_3$ ratio, and a decrease in the loss of water on heating to 800°C. The $Fe_2O_3 : Al_2O_3$ ratio varied little in fractions from the same horizon. The content of MgO sometimes rose with decreasing particle size. The dehydration curves, after the destruction of organic matter and transformation into H clays, indicated a decrease in gel content with increasing grain size. In kaolinitic, but not in montmorillonitic clays, increase in grain size notably diminished total water loss. Grain size, except with little-developed soils, did not appear to influence the shape of the curves.

[1625] 631.414.3.03 : 549

LEENHEER, L. DE Les propriétés sorptives des sols et leur interprétation minéralogique, avec application aux sols argileux des Polders marins. **[The sorptive properties of soils and their mineralogical interpretation with application to the clay soils of marine polders.]** *Bull. Soc. Belge Géol.* 57, 1948 (299-320). [F.]

The sorptive properties of the three chief clay-mineral groups are quite distinct. The kaolin group is distinguished by feeble sorption and retention capacities and by its rapidity of exchange: the montmorillonite group by its capacity to absorb water and to swell; and the mica group by having an intralamellar space of about 3.4 Å, so that only cations of that order of size (K) or smaller (NH_4) can be replaced. The mica group also shows selective sorption for K and NH_4 ions, and sorbs H ions very energetically. The mean sorption capacities of the groups in m.e. per 100 g. of mineral are: kaolin 6, montmorillonite 180, mica 40. By determining the sorption capacity of a soil and the selectivity of the clay minerals (e.g., by Schachtschabel's method of leaching the soil with a mixture of Ca and NH_4 acetate) it is possible to form a general idea of the soil's mineralogical make-up.

[1626] 631.415.1 : 631.416.862.1

CHERNOV, V. A. **[The nature of soil acidity. III. The mechanism of the reaction of acid soils with a solution of a base.]** *Pochvovedenie* 1949 (256-267). [R.]

Aqueous and KCl suspensions of a krasnozem were potentiometrically titrated with KOH, and the concentration of Al in the equilibrium solution was determined at each point on the titration curve. The data indicated that the OH of the base combined with absorbed trivalent Al ions, forming basic compounds, while the K of the base combined directly with the soil particles. The transformation of Al ions into a basic form took place on the surface of the soil's solid phase within the pH range of 5.4-7.2. Titrations of $Al_2(SO_4)_3$ with a base showed that appreciable quantities of Al went into solution only at pH values below 5.

[1627] 631.415.36

REEVE, R. C.; ALLISON, L. E.; PETERSON, D. F., JR. **Reclamation of saline-alkaline soils by leaching.** *Utah Agric. Expt. Sta. Bull.* 335, 1948, pp. 52. [U.S. Reg. Salinity Lab., Riverside, Calif.]

Saline-alkaline clay and clay-loam soils of 3 series, having conductivities of the saturation extracts > 4 millimhos/cm. and exchangeable-Na percentages > 15 were leached with 1-4 acre-feet of water and sown to autumn wheat receiving 3 irrigations of about 6 inches each. The soils contained 2-23 tons/acre-foot of gypsum, which was sufficient for reclamation purposes. Only at one location did the application of gypsum improve infiltration. Leaching with 4 feet of water effectively reclaimed these soils where drainage was sufficient. Wheat yields increased directly with the amount of leaching water applied. At high salt levels large reductions in salt content gave only slight improvements in yields, whereas at low salinity levels small decreases in salt gave large increases in yield.

[1628] 631.415.36 : 546.72

GASPARINI, M.; ALINARI, E. La correzione dei terreni argilloso-alcalini. **[Amendment of heavy alkaline soils.]** *Ital. Agric.* 86, 1949 (265-268). [I.]

The possibility is discussed of using ferric compounds (of nature not stated) in view of their high flocculating power and because under alkaline and sub-alkaline conditions ferric salts can form films of gel alleged to confer a crumb structure on dispersed clay particles. For soils already in use, a ferric-salt preparation should be broadcast at the rate of 5-7 quintals/ha. after ploughing and gradually harrowed in. For new soils 15-20 q./ha. are recommended, half before and half after ploughing; the depth treated should not exceed 25-30 cm. Plantations, orchards and vineyards may benefit from similar treatment, particularly if the plants are young and only the soil around them is treated. Normal manuring and fertilizing should accompany the treatment.—R.N.

631.416 COMPOSITION OF SOILS

(*See also* Abs. Nos. 1712, 1842)

[1629] 631.416 : 631.432.3

VOLK, G. M.; BELL, C. E. **Maintenance of soil reaction and organic matter and their role in retention and availability of major nutrient elements.** *Fla. Agric. Expt. Sta. Rept.* 1946-47 (99).

Sulphates, chlorides and nitrates of K, Mg and Na in various combinations were added to 1/2000-acre lysimeters of 4-foot depth filled with fine sandy soil which was kept fallow. Ca and Mg moved more readily in the presence of Cl and NO_3 than with SO_4. The reverse was true for K and to some extent for Na. The movement of Na was depressed slightly by Ca and Mg in the presence of NO_3, Cl and SO_4 and the movement of K, Ca and Mg was depressed by Na in the presence of SO_4. Loss of readily-soluble sulphate from band-placed fertilizer was greater than from broadcast applications; this is the reverse of findings for sulphate in the form of gypsum. Movement of SO_4 was retarded by the presence of Cl and NO_3.

[1630] 631.416.1 : 525.5

DROUINEAU, G.; LEFÈVRE, G. Nouvelles conceptions sur la dynamique de l'azote dans les sols. [**New concepts of the dynamics of nitrogen in soils.**] *C.R.Acad. Agric.* 35, 1949 (328-330). [F.] [Sta. Agron., Antibes]

The mineral-N content of normal-$CaCl_2$ extracts of soils mixed with an equal volume of quartz sand, kept at optimum humidity and receiving no lime or fertilizers was determined before and after the soils had been kept for one month at 28°C, the difference between the 2 results giving the "mineralizable N", which varied considerably with the season of sampling and with the agricultural history of the soils. Unfertilized uncropped soils contained very little mineralizable N when the mineral-N content was highest (at midsummer near sea level and in autumn at an altitude of 1000 m.), but a quantity of mineralizable N of the order of 60 kg./ha. was re-formed apparently microbiologically in winter, this augmentation corresponding to a variable fraction of the mineral-N losses of the arable layer between these periods. Thus the existence of 2 distinct seasonal phases in the soil-N economy is indicated.

[1631] 631.416.1 : 631.584

CHAPMAN, H. D.; LIEBIG, G. F.; RAYNER, D. S. **A lysimeter investigation of nitrogen gains and losses under various systems of covercropping and fertilization, and a discussion of error sources.** *Hilgardia* 19, 1949 (57-128). [Calif. Citrus Expt. Sta., Riverside]

Losses of more than 60 lb./acre/year of N occurred in a lysimeter cover-cropped with mustard and fertilized heavily with nitrate, and in lysimeters receiving cereal straw in autumn together with N fertilizer. The loss is thought to be due to gaseous volatilization. Growth of purple vetch and sweet clover as winter cover crops, turned under in spring, produced gains of 150 lb./acre/year of N. When N fertilizer was added to these legumes at rates of 100 and 200 lb./acre/year, the net gains were progressively reduced, the sweet clover being more affected than the vetch. 4822 lb./acre of dry matter of vetch was turned under and 4148 lb. of sweet clover.

In a second 5-year period, incorporation of 5000 lb./acre of dry cereal straw in autumn, without additional N, increased N by 48 lb./acre annually. The net gain with a winter cover crop of mustard without N was 40 lb./acre/year. Only 988 lb./acre of mustard was turned under due to progressive N depletion of the soil.

Irrigation was sufficient to meet the water requirements of the crops and leaching through 4 feet of soil occurred only in years when the rainfall exceeded 10 inches. Considerable N leached out in years of heavy rainfall or when rain fell immediately after irrigation. More than 99% of the soluble N was in nitrate form and leaching losses were greatest in non-cover-cropped lysimeters and in those receiving 200 lb. of N fertilizer. For the second 5-year period average annual losses of N ranged from 3.8 lb./acre/year in the N-deficient, non-fertilized mustard-cover-cropped lysimeters to 88 lb. in the lysimeters with cereal straw receiving 200 lb. of N. Leaching losses were much greater from the legume-cover-cropped lysimeters than from those cover cropped with mustard. Although N fertilizer increased the yield of legumes, no benefit carried through to the summer-harvested Sudan grass. The N requirement for maximum yield of this crop is about 125 lb./acre/year.

The substantial decrease of total N in the

lysimeters during the first 5 years seems to have been due to the leaching out of accumulated nitrate. In the second 5-year period, increases in the total N were greatest in the legume lysimeters. Organic carbon increased concurrently with total N.

Results of the experiment show the wastefulness of high-level N fertilization. Under these conditions substantial amounts of N are likely to be lost by gaseous volatilization, leaching losses are likely to be high, fixation will be reduced and neither yield nor quality of the crops will be improved.

[1632] 631.416.2
RIEHM, H. Bodenuntersuchungen und Thünensche Kreislehre. [**Soil studies and Thünen's "ring" theory.**] *Z. PflErnähr. Düng.* 43, 1949 (133-143). [G.] [Augustenberg Res. Inst.]

Von Thünen's theory (1842) was that the intensity of cultivation decreased with increasing distance from the farm building, and in the spirit of his note that acidity, as registered by litmus paper, increased with distance from the building, a study has been made of the lactate-soluble P status of the individual farms and towns and of Germany as a whole. The intensity-ring distribution is more or less obvious in each case. Analysis of the soil-P map of a village in which the holdings are still composed of several scattered strips shows clearly that the P status depends on management—especially fertilizing—more than soil and illustrates the urgent need of consolidating such holdings.

[1633] 631.416.2 : 546.16
MACINTIRE, W. H.; SHAW, W. M.; ROBINSON, B. **Migrations of phosphorus and other elements from variously phosphated soils, with and without calcium fluoride and liming materials.** *Soil Sci.* 67, 1949 (377-394). [Univ. Tenn. Agric. Expt. Sta.]

Three long-term lysimeter experiments indicate that (a) incorporation of CaF_2 at abnormal rates and a build-up of F do not induce measurable variations in the passage of phosphates from substantial inputs of the several phosphates of Ca, (b) the type of phosphate should be specific for a particular soil, in relation to its initial reaction and to its reaction subsequent to incorporations of limestone or dolomite, (c) conditions favouring the formation and maintenance of di-Ca and di-Mg phosphates in the soil prolong a higher degree of P availability, (d) these conditions are more effectively induced by dolomite than by limestone, (e) preliminary liming of acid soils causes better P mobility and availability of the P added in acidic form and (f) H_3PO_4, mono-Mg phosphate and mono-NH_4 phosphate react advantageously in soils with adequate Ca.

[1634] 631.416.2 : 631.414.324
ADERIKHIN, P. G. **The role of exchangeable cations in the absorption of phosphoric acid by chernozems.** *Pochvovedenie* 1949 (302-306). [R.]

Samples of different chernozems were saturated with Na, K, NH_4, Mg, Ca and Fe, treated with mono-Ca phosphate for 24 hours, filtered and the absorbed P determined. In different soils the greater the base-exchange capacity the greater the absorption of P, and in any one soil saturated with different cations P absorption decreased in the order Fe (trivalent) $>$ Ca $>$ Mg $>$ K $>$ NH_4 $>$ Na.

[1635] 631.416.2 : 631.417
DMITRENKO, P. A. [**The phosphorus content in the organic portion of the soil.**] *Pochvovedenie* 1948 (495-501). C.A. 43 (4409). [R.]

Meadow-bog had the lowest percentage of P in organic form (0.21-0.39%), grey podzolic soils the highest (1.27-1.41%) and chernozem and solonets soils intermediate amounts (0.95-1.43%). The ratio C : P_2O_5 varies in the soils examined from a low 30.81 to a high 61.6 (in deep chernozem). In peat the C : P_2O_5 ratio goes up to 280.

[1636] 631.416.2 : 631.417
SOKOLOV, D. F. [**The presence of several organic phosphorus compounds in the soil.**] *Pochvovedenie* 1948 (502-513). C.A. 43 (4409). [R.]

Phosphatides make up an insignificant part of the organic P of soils (0.4-2.6% P_2O_5). Only traces are found in podzols and red loams. The nucleoprotein P extracted with 1% alkali solution makes up 20-22% of all the organic P of most mineral soils and of regular peat, and when Ca and Mg are removed from the exchange complex of chernozems by treating the samples with 1% HCl the percentage of nucleoprotein P rises

to 59-60 and in peat to 34.5. Better results in extracting the P in the form of nucleic acid were obtained by twice hydrolysing the chernozem and peat, for half an hour each time. Determining the nucleoprotein P indirectly by determining the purine forms of N is very cumbersome. The results by this method are slightly higher than those by the alkali-extraction method.

[1637] 631.416.2 : 631.67
PAUL, H.; DELONG, W. A. **Phosphorus studies. I. Effects of flooding on soil phosphorus.** *Sci. Agric.* 29, 1949 (137-147). [Macdonald Coll., Que.]

Experiments on Ste Rosalie soil of the St. Lawrence basin originated from the problems of sugar-cane nutrition in flood-fallowed soils in British Guiana, which are heavy, acidic and of low P content and on which crops failed to respond to P fertilizers. 800-g. samples of Ste Rosalie soil were subjected in the laboratory to flooding both under slow free-drainage and under stagnant conditions, separate experiments being conducted in each case with water and 1% glucose solution. The duration was 30 days in most cases, but longer in some of the stagnant-water experiments.

With drainage the following results were observed. A slight increase in pH occurred with water flooding, but a marked decrease, due to anaerobic fermentation, with glucose flooding. A downward movement of easily soluble inorganic P (extractable with 0.002 n. H_2SO_4) was indicated, more pronounced in the soil-glucose system, and accumulation of easily soluble organic P occurred in both. Under stagnation, pH changes were less marked, but in the same directions as above. No movement of inorganic P was noted, but there was considerable accumulation of organic P. Analysis after air-drying revealed that extractable organic P was reduced well below that of the wet soils, but was about three times as high as in unflooded soil samples. Loss of easily soluble inorganic P was increased in proportion to the duration of flooding, and was very high in the soil-glucose system. Thus it appears that available soil P is adversely affected by lengthy flooding, especially when readily decomposed organic matter is present and desiccation follows.

Evidence exists for relating the results to the biological reduction of iron during flooding, and its re-oxidation during desiccation, with consequent increase in the P-fixing capacity of the sesquioxide fraction. Saturated $Ca(OH)_2$ failed to prevent, but checked slightly, the loss of available P. A considerable check was, however, effected by restriction of free oxygen and prevention of desiccation. Fixation of applied phosphate was much greater in flooded than in normal soil, even when the former had been air-dried.

[1638] 631.416.315 : 616.44-006.5
KÖHN, M. Über den Jodgehalt von Böden und Wässern aus einigen kropfreicheren und kropfärmeren südbadischen Orten. **[The iodine content of soils and waters from some villages in South Baden in relation to goitre.]** *Z. PflErnähr. Düng.* 45, 1949 (148-158). [G.]

Deficiency of iodine was presumed to be the cause of human goitre. To confirm this theory, numerous investigations of soils and drinking water were made in 1941/42. The iodine content of soils and drinking water varied even in small areas, and the different layers of the soil profile also showed great differences. No relationship was found between the iodine content and the humus, clay content and pH of the soil, or between the iodine content of soil and drinking water and the frequency of the disease.—B.F.G.

[1639] 631.416.4 : 631.414.3
BARBIER, G.; DURROUX, M. Équilibres auxquels donne lieu dans le sol la fixation de potassium à l'état non échangeable. **[Equilibria due to the fixation of potassium in the non-exchangeable form in the soil.]** *C.R.* 228, 1949 (1747-1749). [F.]

Studies with a loam poor in exchangeable K and receiving 250 kg./ha. of K_2O per year for 28 years indicate that K ions move inwards or outwards in the clay particles depending on whether the external surfaces of the particles are more or less charged with K ions than the internal surfaces. In the soil studied, however, the regeneration of exchangeable K was slow, although large amounts of K fertilizers had been applied.

[1640] 631.416.4 : 631.414.324
AYRES, A. S.; HAGIHARA, H. H.; FUJIMOTO, C. K. **Horizonal distribution of exchangeable potassium in soils of the island of Hawaii.** *Hawaii Plant. Rec.* 53, 1949 (25-41). [Expt. Sta. HSPA and Hawaii Agric. Expt. Sta.]

Soils examined included humic latosols, hydrol humic latosols, reddish prairie soils and a lithosol, all of which are acidic, the prairie soils only at the surface. They are well drained and, in high-rainfall regions, poor in exchangeable bases. Samples of sugar-cane soil were investigated from successive 6-inch depths between rows of cane, and exchangeable K extracted with n. NH_4 acetate at pH 7.0. Organic matter and NH_3 were removed and K was determined by Volk's sodium-cobaltinitrite procedure.

Results established that (1) surface supplies are often unrelated to total available K; (2) K decreased sharply in the upper 12-24 ins., below which concentration varied; (3) in humid regions, profile distribution was irregular, and K levels generally low (<0.20 m.e./100 g.), whereas in some drier soils, derived from young volcanic ash, very high concentrations existed.

Since sugar cane is comparatively deep rooted, available K for this crop cannot accurately be estimated by examining upper soil layers only.

[1641] 631.416.856
LEES, H. **Copper-retaining powers of different cacao soils.** *Biochem. J.* 43, 1948 (624-626).

The power of soils to retain Cu was determined on 32 samples and compared with the organic-matter content. Good cacao soils had higher organic-matter content and Cu-retaining power than the poor soils, but the relationship between the two was not linear. The distribution of Cu between a soil and a solution in equilibrium with it follows a Freundlich isotherm.

631.417 ORGANIC MATTER

(*See also* Abs. Nos. 1682, 1940)

[1642] 631.417 : 631.43
BARBIER, G. Observations sur la culture sans fumier dans les sols de limon. [**Growing crops in loam soils without manure.**] *Ann. Agron.* 18, 1948 (701-707). [F.]

An important point when growing crops without the addition of organic matter is to establish the number of years necessary for the soil to attain the stage at which the total humus content becomes stabilized. The chief value of added organic matter is its effect on the physical properties of the soil. It is considered that organic matter which originates in the soil itself is much more likely to improve the physical properties than humic materials stabilized outside the soil. To maintain the humus content when farming without manure the ploughing-in of straw with the addition of suitable N manures and green manuring is recommended.

[1643] 631.417 : 631.461
FRASER, G. K. **Micro-organisms in relation to the production and degradation of soil organic matter.** *Chem. Indust.* June 11, 1949 (375-377).

Some aspects of the progress of investigation of soil organic matter are reviewed and some of the general problems involved in such investigation are indicated. The relationship of soil micro-organisms to fats and waxes, carbohydrates, nitrogen compounds and aromatic compounds is considered. It is concluded that the humus complex of soil is contributed to by the extra-cellular products of micro-organisms that are likely to play a greater part in determining the basic structure of the soil than does more bulky organic material introduced into the soil. They may be, apart from direct nutritional effects, the chief factor in the organic fertility of the soil.

[1644] 631.417.2
DRAGUNOV, S. S.; ZHELOKHOVTSEVA, N. J.; STRELKOVA, E. I. [**Comparative investigation of humic acids of soil and peat.**] *Pochvovedenie* 1948 (409-420). C.A. 43 (3127). [R.]

Humic acids from peat, chernozem and a podzol, on methylation with methanol saturated with HCl to determine the carboxyl groups, showed remarkable similarity. On methylation with dimethyl sulphate and diazomethane there was a sharp difference between the humic acids extracted from the soils and the one from peat. The diazomethane treatment also brought out some differences between the humic acids of the two soils. The humic acids were fused with

KOH, taken up in dilute H_2SO_4 and extracted with ether to yield crude aromatic material. The ether was evaporated and the residue treated with benzene to recover pyrocatechol. Humic acid of chernozem when fused with $FeCl_3$ gave a red-violet colour—not green which is characteristic of catechol. Aqueous solution of the melt gave with Br a flocculent precipitate and with furfural in HCl after a few hours a dark precipitate, these reactions indicating phloroglucinol. On the basis of the data presented, structural formulae for the humic acids from chernozems and peat are proposed that are considered as a scheme for a working hypothesis.

[1645] 631.417.2

FRÖMEL, W. Die Bodenkörperregel bei Huminsäuren aus Moorböden. **[The soil-solid-phase rule in its application to humic acids from fen soils.]** *Koll. Ztschr.* 111, 1948 (166-174). [G.] [Weihenstephan, Munich]

The solubility, in NaOH of different concentrations, was studied of 3 fen soils and of the humic acids extracted from them by NaOH or NaF and the results were expressed in solubility curves. Two of the soils gave curves agreeing with Ostwald's soil-solid-phase rule (i.e., the solubility depended on the quantity of solid present) and the third showed the typical curve for molecular-disperse solutions. The acids from the NaF extraction showed regular peptisation curves for medium solvent concentrations and quantities of soil, in accordance with the solid-phase rule, but the curves for the NaOH series deviated from the rest in that their final horizontal parts closely approached the x axis. This effect is discussed, as is also the difficulty arising within the limits of the peptisation curve characterized by the crest and solubility maximum, where the same solubility may be shown for different masses of soil solid present, thus permitting no simple proportionality between the content of the solution and the mass of humic acid in the soil used.

631.42 TECHNIQUE AND ANALYSIS

(*See also* Abs. No. 1807)

[1646] 631.42.005

KELLEY, O. J.; HAISE, H. R. **Soil-sampling machine for obtaining undisturbed cores.** *J. Amer. Soc. Agron.* 39, 1947 (828-830). [Utah St. Agric. Coll., Logan]

A power-driven machine capable of taking undisturbed 2-inch cores from a depth of 30 inches is described.

[1647] 631.421

HAMY, A. Nouvelle méthode d'expérimentation au champ. **[A new method of field experimentation.]** *Ann. Agron.* 19, 1949 (271-276). [F.] [*Sta. Agron.*, Chateauroux]

A graphical method which eliminates the effects arising from soil heterogeneity involves the use of a number of long, narrow adjacent strips of land, for example 50 m. × 80 cm. per strip. The positions of the strips are made the abscissae and their yields are entered as ordinates. If the whole plot has received the same treatment, the curve will be continuous. If half of the plot, say 8 strips, has received a treatment and the other 8 are untreated, 2 curves will be obtained separated by a discontinuity. By prolonging the curve for the control plots parallel to that of the treated plots, until the limit of separation of the treatments is reached, and prolonging that for the treated plot up to the same limit, a measure is obtained of the respective yields on the *same strip* of soil situated at the limit of separation of treatments. Preliminary work indicates that the more heterogenous the soil, the longer and more numerous should be the strips used. With hoed plants such as beet, where gaps may occur, a given number are harvested from each strip from positions not situated next to gaps. Where a plot is formed of more or less compact areas of worse and better land, the controls should be on the better part. Experiments with spring wheat and barley and with sugar beet are discussed.

[1648] 631.422 : 631.811

WOLF, B. **How Seabrook Farms step up vegetable crop yield with commercial fertilizer.** *Agric. Chem.* 3, 1948 (37, 39, 41, 73).

The Seabrook vegetable farms of 14,000 acres of fairly light sandy soils depend on

rapid soil tests to determine the fertilizer to be used. The soil nutrient levels associated with good yields under local conditions and also the amounts of fertilizer needed to change from one level to another, have been tabulated. Mixed fertilizers of 5 different ratios, almost entirely inorganic and largely of ammoniated super., super. and muriate of potash, supply 95% of the total consumption. B and Mn are added to all fertilizers in quantities depending on the grade and crop. The soil pH is kept at 6.0-6.5 and fertilizers are applied in autumn to an established cover crop. With N, additional soil tests are needed after the crop has made some growth. (See also *Soils and Fert.* IX, p. 82).

[1649] 631.423 : 544.6
MITCHELL, R. L.; SCOTT, R. O. **Applications of chemical concentration by organic reagents to spectrographic analysis.** *Spectrochim. Acta* 3, 1948 (367-378). [E.]

Increased accuracy in the spectrographic analysis of soil extracts, plant materials, etc., can be obtained by the use of preliminary chemical concentration. By precipitation with a mixture of 8-hydroxyquinoline, tannic acid and thionalide complete recovery can be obtained of Co, Ni, Mo, Sn, Pb, Zn, Cr, V, Ti, Be and Ge in a matrix of Al_2O_3 with combined spectrographic and chemical errors seldom exceeding $\pm$ 10% for quantities of 2-100 microgrammes.

[1650] 631.423.3 : 631.416.13
SOWDEN, F. J.; ATKINSON, H. J. **The determination of nitrates in colored soil extracts.** *Canad J. Res.* B. 27, 1949 (76-80). [Div. Chem., Sci. Serv.]

For various reasons, the following agents are impracticable: phenodisulphonic acid, colour-absorbing agents including charcoal, oxidizing agents, superoxol. Photoelectric colorimetry is unreliable.

Alternatively, Devarda's alloy and Nessler's reagent are used, 20 ml. of extract being deci-normalized with NaOH and steam-distilled until free of NH_3. Devarda's alloy (0.2 g.) is introduced to the cooled liquid after addition of 0.5 ml. of n. NaOH, and escape of NH_3 prevented by absorption in acidified glass wool (0.1 n. HCl). After shaking and leaving overnight, NH_3 is distilled into 5 ml. of the same acid, the distillate treated with Nessler's reagent and its optical density read in a blue-filter Klett-Summerson colorimeter, using a standard curve. Results tend to be low for high concentrations and are most accurate for small aliquots with N below 2.5 p.p.m. For higher concentrations the standard nitrate curve should replace the standard ammonia curve to allow for incomplete distillation.

[1651] 631.423.3 : 631.416.2
BURRIEL, F.; HERNANDO, V. El fosforo en los suelos españoles. III. Extracción del fosforo total de los suelos. [**Phosphorus in Spanish soils. III. The extraction of total phosphorus.**] *An. Inst. Esp. Edafol.* 7, 1948 (489-527). [Sp.]

The methods in use are described. Sherman's 60% perchloric-acid method is preferred, but in view of the difficulty of obtaining the acid and the costliness of the method for series determinations the following method is proposed which gives results in agreement with Sherman's and the Na_2CO_3-fusion methods. To 0.5 g. of 100-mesh sieved soil 5 c.c. of HCl (D=1.19), 5 c.c. of HNO_3 (D=1.4) and 5 c.c. of perchloric acid (D=1.534) are added in that order and all soil washed to the bottom of the container. After mixing, the whole is kept at 115-120°C., with occasional shaking, until nitrous fumes are evolved, after which the temperature is raised to 200°C. until the mass is yellowish white and clouds of perchloric-acid fumes evolve. After cooling, filtering and washing with water, the colorimetric determination is made. (See *Soils and Fert.* XI [792]).

[1652] 631.423.3 : 631.811.4
LITYŃSKI, T.; ZIMNY, F. **A new electrometrical method for the determination of the lime requirement of the soil.** *Bull. Acad. Polon. Sci. Let.* (*Cl. Sci. Math.*) 1948 (24-33). [E.]

In a method described in an earlier paper (see *Soils and Fert.* XI [1095]) soil is shaken with a solution of n. Ca acetate and the filtrate titrated electrometrically with n./10 NaOH to pH 7.8. Total exchange of H with Ca ions, however, only occurred at dilutions corresponding to a soil-solution ratio of 1 : 60, involving large quantities of acetate and making the method unsuitable for routine analysis. In the proposed modification the titration is carried out

directly on the soil-acetate suspension without filtering.

5 g. of air-dry soil is weighed into a 250 c.c. beaker, 100 c.c. of n. Ca acetate is added and, after mixing, allowed to stand overnight. The suspension is then mixed mechanically and titrated next day with n./10 NaOH to pH 7.8. The number of c.c. of NaOH required for 10 g. of soil gives the y value, i.e., the hydrolytic acidity, of the soil.

[1653] 631.423.3 : 631.811.4
PETER, H. Die automatische Kalkbedarfsbestimmung nach Goy-Roos. **[The automatic lime-requirement determination according to Goy-Roos.]** *Z. PflErnähr. Düng.* 42, 1948 (219-223). [G.]

The electrometrical titration by Goy-Roos which allows the determination of the lime requirement with special regard to the buffer capacity of soils has been developed to a rapid test method. 500-600 lime-requirement determinations could be handled daily and accurately by using 8 titration tripods, one multiflex galvanometer and a switchboard. Two skilled workers and one technician only are required.—B.F.G.

[1654] 631.423.3 : 631.811.4
TERTS, I. Különbözö kötüttsēgü talajok mészszükségletē. **[Lime requirement of soils of various textures.]** *Az Agrártūd. Eg. Kert- Szölögazd. Karán. Közlem.* 12, 1948 (185-209). [H.e.]

The Kappen method using Ca acetate and the Mados method based on the absorption of NH_3 were compared for determining the lime requirement of Hungarian soils ranging from sands to stiff clays. Both methods, compared with the standard method of Jensen, gave varying results, but the numbers obtained can be used for calculating the lime requirement of neutral soils. The lime requirement varies with the texture of the soil.

[1655] 631.423.7
TOTH, S. J.; PRINCE, A. L. **Estimation of cation-exchange capacity and exchangeable Ca, K and Na contents of soils by flame photometer techniques.** *Soil Sci.* 67, 1949 (439-445). [N.J. Agric. Expt. Sta.]

The procedures described and discussed are revisions of those used with plant tissues, which have much narrower Ca : Na and Ca : K ratios than soils.

[1656] 631.425.22 : 631.437.31
COLMAN, E. A.; HENDRIX, T. M. **The fiberglas electrical soil-moisture instrument.** *Soil Sci.* 67, 1949 (425-438). [Calif. For. Range Expt. Sta., Berkeley]

The soil unit includes a monel screen fiberglas-cloth sandwich sensitive to moisture and a thermistor ; the meter unit is a battery-powered alternating-current ohmmeter. Temperature-induced changes in resistance are the same for various soils ; moisture can be measured from saturation to well below the wilting point ; freezing and thawing are indicated above the wilting-point ; moisture tensions can be related through a calibration curve to resistance measurements ; a random lot of units were closely uniform in their moisture : resistance relationships ; distilled water should be used in laboratory calibrations of units to be placed in field soils.

[1657] 631.425.4
FONT-ALBA, M. Sobre un metodo de medida del grado de agregación en suelos. **[A method of determining the degree of soil aggregation.]** *An. Inst. Esp. Edafol.* 7, 1948 (633-641). [Sp.]

Endell's method was used to follow the degree of disaggregation in several soils immersed in water, and curves characteristic for each soil were constructed relating the percentage aggregate destruction to the time of immersion. A given volume of soil is held in a container attached to the lower end of an upright graduated cylinder, and the whole is floated in water. If a is the reading on immersion (at the maximum depth reached), b that after complete disaggregation and c that after t minutes of immersion, then the expression $100\ (a-c)/(a-b)$ gives S, the apparent percentage of disaggregation after the time t. S in natural soils approximates closely to the real percentage.

[1658] 631.425.4
PEERLKAMP, P. K. Het meten van de bodemstructuur. **[The evaluation of soil structure.]** *Landbouwk. Tijdschr.* 60, 1948 (321-338). [Du.e.] [Landbouwproefsta. Bodemk. Inst. T.N.O., Groningen]

Methods of evaluating soil structure have developed along two lines : determination at the moment of sampling, and measurement of resistance to the disintegrating effects of climate and tillage. In the first group the

volume occupied by the three phases, solid, liquid and gases is determined, and in the second, wet sieving methods are used. The effects of clay content, gypsum dressings, farmyard manure, green manuring and leys on soil structure as determined by wet sieving are illustrated.

[1659] 631.425.5
MYLVAGANUM, T. **Dispersion of soils for mechanical analysis.** *Cent. Bd. Irrig. J.* 3, 1946 (118-120). B.A.C. 1949 (165).

Tests were made to select a suitable deflocculating agent for facilitating dispersion of soil particles as completely as possible. For soils with particle sizes of 0.05-0.005 mm. (clays or sandy clays) a mixture of 20 ml. of n. Na_2CO_3 and 20 ml. of n. NaOH gave optimum dispersion.

[1660] 631.425.5
KILMER, V. J.; ALEXANDER, L. T. **Methods of making mechanical analyses of soils.** *Soil Sci.* 68, 1949 (15-24). [U.S.D.A.]

[1661] 631.427.2 : 631.466.1
CHESTERS, C. G. C. **A contribution to the study of fungi in the soil.** *Trans. Brit. Mycol. Soc.* 30, 1948 (100-117). R.A.M. 28 (240).

A method of investigating the fungal flora of the soil is described.

631.43 SOIL PHYSICS

(*See also* Abs. Nos. 1657, 1658, 1703, 1706)

[1662] 631.43 : 536.7
CHATELAIN, J. **Thermodynamics of soil moisture.** *Soil Sci.* 67, 1949 (305-309). [Utah State Agric. Coll.]

Some examples are given of where caution is necessary in applying the laws of thermodynamics to the soil.

[1663] 631.43 : 636 : 631.62
WALKER, C. **Management of poaching soils.** *N.Z. J. Agric.* 78, 1949 (365-367). [Dept. Agric., Palmerston North]

In parts of New Zealand heavy fertile soils are subject to severe poaching under stock during wet weather. Drainage is recommended. Underground tile or mole drains or a combination of both are more efficient on heavy soils than are open drains, but open drains are often necessary for conveying discharge from the tile or mole drains. In marine silts mole drains are unsuitable. Drained land may be disced in spring as soon as it is dry enough and sown with grass, but the risk of weed invasion is considerable. Rolling the land with light rollers when the soil is still soft will improve the surface and restore the pasture. Land should not be grazed for 3 weeks after rolling.

[1664] 631.432 : 631.547.2
WÄRE, M. Maan vesisuhteista ja viljelyskasvien sadoista maasojan vesitaloudellisella koekentällä vuosina 1939-1944. **[Soil-water conditions and crop yields on the experimental plots at Maasoja in 1939-1944.]** *Maa-Ja Vesitek. Tut.* 5, 1947, pp. 240. [Fi.g.]

The plots are on underdrained or open-ditch drained clay and peat soils, and are used for studies of the effects of seasonal water changes on the agricultural use of river bank areas. Detailed records are provided of weather; the depths of snow, soil frost and water tables and the water content at different depths to 70 cm.; times of snow melt and soil thawing and the effects on yields of rotated clover, oats and timothy of rainfall, artificial rainfall, ground-water depth and the vertical distance between soil surface and varied ditch-water levels.

Snow depth was 26% greater on the drained than on the ditched soil where snow collected in the ditches. In clay, frost penetration was 6% deeper than in peat and was 11% deeper in ditched clay than in drained. Soil thawing occurred 3-4 days earlier on drained soils. Draining advanced by 3-4 days the time of maximum ground-water height in spring and postponed (in clay soil) the autumn maximum by 2 weeks. Evaporation experiments indicated that in clay the speed of water rise is too low for crops to obtain much water in dry periods when the ground water is more than 20 cm. deep, whereas water supply was plentiful in peat even with the ground water at 40 cm.

The effect of holding the ditch-water level at 20 cm. below the soil surface throughout June was to delay oat flowering and ripening by 3 days. Similar treatment in July delayed ripening by 1 day (as did artificial rain) and slightly increased weed growth. In June the treatment delayed clover flowering

by 5-7 days and timothy flowering by 2-4 days. The N content of hay was lowered by both the June and July treatments. June treatment considerably increased clover and timothy yields, especially in dry years and injured oats only on peat soils. As the depth of the water was decreased from 20 cm., oat-grain yields became much depressed, reaching 25% when the depth was 7 cm. With clover and timothy on clay in dry years, maximum growth occurred with a depth of 17 cm., and drought damage did not occur with depths of <25 cm.

[1665] 631.432 : 631.557

TRÉNEL, M. Zur gutachtlichen Beurteilung des Einflusses der Grundwasserabsenkung auf den Ernteertrag im Löss. [**Assessment of the influence of the lowering of the ground water level on crop yields in loess.**] *Z. PflErnähr. Düng.* 45, 1949 (133-147). [G.] [Humboldt Univ., Berlin]

The estimation for legal and agricultural purposes of damage caused by the sinking of ground-water levels by water works, etc. is reviewed. Two insufficiently investigated questions are involved: 1. the depth of the root systems of crop plants. 2. the capillary or other rise from the ground water. Root measurements made by the author in 1940 on loess showed smaller values than those given in the literature; the root extension always depends on local conditions. The average rise of capillary water in loess soil was presumed to be 2.50 m., but the velocity of the rise is still a matter of dispute. Present knowledge of the whole problem does not justify assessment along these lines and the author recommends as a basis the comparison of yields over a period before and after the sinking.—B.F.G.

[1666] 631.432.2.005

KIRBY, F. L. **Infiltration test.** *J. Forestry* 46, 1948 (375-376). [U.S. Forest Service]

To test the rapidity with which water can soak into soil, a stout cylinder 12 inches in diameter and 5 inches long is driven about 2 inches into the ground, so that water poured into it cannot escape except into the soil within the circle. The time taken for 1 gall. of water to infiltrate into the ground on ungrazed land was 6 minutes 17 seconds and on grazed land 38 minutes 53 seconds.

[1667] 631.432.3 : 546.332.64

KATTI, P. K. **Studies on soils. Part IV. The effect of chlorides on (1) the black cotton soil previously treated with sodium carbonate and (2) the alkali "Bari" soil of the Punjab.** *Proc. Indian Acad. Sci.* 29A, 1949 (231-242). [Met. Office, Poona]

A number of chlorides used can pass easily through a layer of Poona black cotton soil previously made impermeable by Na_2CO_3. Li, Na, K and NH_4 chlorides could not restore the permeability permanently, as the soil becomes impermeable again if these chlorides are replaced by water. Chlorides of Ca, Sr, Ba and Mg restored permeability permanently. Na_2CO_3 cannot act as a swelling agent in the presence of chlorides of Li, Na, K or NH_3. The swelling and shrinking of a soil in the various salts is due to swelling and shrinking of individual particles of very small dimensions. The results of these experiments have been used to rectify the natural alkaline "Bari" soil of Punjab which contains large quantities of Na_2SO_4 and Na_2CO_3.

[1668] 631.432.3 : 631.434

O'NEAL, A. M. **Soil characteristics in evaluating permeability.** *Soil Sci.* 67, 1949 (403-409). [U.S.D.A.]

The U.S. Soil Conservation Service has established 7 permeability classes distinguished by percolation rates measured by a standard procedure on presaturated soil. The classes and rates vary from Very slow (less than 0.5 in./hour) to Very rapid (10 in./hour or more).

The most significant factor in evaluating permeability is type of structure of which the five chief types are prismatic, cubical blocky, fragmental, nuciform and platy. Important factors within a structural type, or between types, are the relationship between the length of horizontal and vertical axes of structural units, the amount and direction in which aggregates overlap, and the durability of aggregates. E.g., when fragmental aggregates have horizontal axes 3-4 times longer than the vertical and a horizontal overlap of 40-50%, the permeability class is usually either very slow or slow. Permeability increases as the length of the vertical axes increases relatively to that of the horizontal.

Overlap is greatest and is horizontal in the low-permeability, and is oblique in the high-permeability classes. The direction of easiest natural fracture of aggregates is horizontal in the least, oblique in the moderately, and vertical in the most permeable soils. Texture is also a factor in permeability, but neither texture alone nor structure alone is a reliable indicator of field permeability.

[1669] 631.432.3 : 631.67
PIOGER, R. Contribution à l'étude des sols en vue de l'irrigation. **[Contribution to the study of soils from the irrigation aspect.]** *Ann. Éc. Agric. Grignon Sér.* 3, 4, 1949 (148-168). [F.]
A theoretical study of infiltration under irrigation from the engineering point of view.

[1670] 631.434 : 631.416
KURON, H. **[Loosening of the soil and plant food economy.]** *Deut. Landw.* 2, 1948 (113 115). B.A. BIII, 1949 (142). [G.]
To a depth of 20 cm. the weight of soil per hectare varies with pore space (*Pv*) from 3780 tons at 30% *Pv*, to 3240 tons at 40% *Pv*, and 2700 tons at 50% *Pv*. Colloidal matter and humus are important in this respect. The effect of loosening the soil, i.e., of increasing *Pv*, increases as the soil is dried. Other soil properties depending on porosity are the base-adsorption capacity and the availability of Ca and other constituents. In general, good cultivation which increases the pore space of soils and provides a good tilth ensures the most economical use of fertilizers.

[1671] 631.434 : 631.433.1
POLSKY, M. N. **[The porosity of soil aggregates.]** *Pochvovedenie* 1949 (212-223). [R.]
The differential porosity of aggregates from the arable layer and the horizons of normal and solodizing chernozems and a chernozem-like meadow soil was studied by a modification of Pigulevsky's, Mishchenko's, etc. paraffin fixing method. The normal chernozem showed a gradual decrease with depth of all classes of porosity, especially the inter-aggregate (see *Soils and Fert.* X. p. 412). In the solodizing chernozem the aggregate porosity (=general minus inter-aggregate) was considerably less, the air porosity being almost nil in the A horizon. In the meadow soil the sod layer was quite unlike the remaining horizons; its active porosity was almost entirely of the capillary type and its air porosity very low. In the arable layer as aggregate size decreased and the specific gravity of the aggregates increased, the porosity decreased considerably. The effect of this on the use of Kachinsky's formula for aggregate porosity is discussed.
Aggregates of size 10-0.25 mm. from profile and arable layer were studied microscopically with sections of 80-100 μ thickness. The microscopic method, unlike the above, reveals the size and other characteristics of the pores of individual aggregates, but does not at its present stage of development permit determinations of the general aggregate porosity.

[1672] 631.434 : 631.461
GEOGHEGAN, M. J. **Influence of micro-organisms on aggregate formation in soil.** *Proc. Soc. Appl. Bact.* 2, 1947 (77-82). B.A. BIII, 1949 (142).
The aggregating effect of microbial metabolic products appeared to be greater than the direct binding effect of cells of micro-organisms. Dextrans and levans had a marked aggregating action. Alginic acid, applied to a structureless Ca-saturated soil had only a small aggregating effect although the Na salt of the acid was slightly more effective. Possibly pectin and alginic acid combine with the Ca of the soil to form insoluble salts. Confirmation of this was obtained, for when the Ca was replaced by H the aggregating effect of the substances was increased greatly. Mould polysaccharides may be of considerable importance in producing crumb structure in soil, although other microbial metabolic products are capable of causing aggregation.

[1673] 631.434 : 631.461
SWABY, R. J. **The relationship between micro-organisms and soil aggregation.** *J. Gen. Microbiol.* 3, 1949 (236-254). [Rothamsted]
Microbial cells and metabolic products affect soil structure by binding loose particles into water-stable aggregates. Fungi had better aggregating power than actinomycetes which were better than gum-producing bacteria. Yeasts, proactinomycetes and many bacteria did not improve aggregation. Fungal hyphae entangled soil particles into stable aggregates; weaker crumbs were

formed by the frailer threads of actinomycetes. A few bacterial strains produced gums capable of glueing soil into water-stable aggregates, but the majority of bacterial slimes were water-soluble after drying. Bacterial gums stabilized the aggregates produced from completely-dispersed soils and kaolin, but not those formed with bentonite or ferric hydroxide. The pH of the soil played a minor part in influencing aggregation. Mixed cultures of fungi or actinomycetes gave slightly better aggregation than pure cultures. Mixtures containing fungi, actinomycetes and bacteria gave good aggregation when all micro-organisms were compatible. The temporary improvement of soil structure after the addition of organic materials can be partly explained by the action of microbes but the permanent crumb structure of many soils must be due mainly to other causes.

[1674] 631.434 : 631.461.61
MOLINA, J. S.; SPAINI, L. S. Coloides producidos en la descomposicion aerobia de la celulosa y su influencia sobre la estructura del suelo. **[The effect on soil structure of colloids produced in the aerobic decomposition of cellulose.]** *Rev. Argent. Agron.* 16, 1949 (33-49). [Sp.e.] [Argent. Min. Agric. Inst. Soils]

The aerobic decomposition of cellulose at air temperature by *Cytophaga* and *Pseudomonas* (?) gave an organic colloid in amounts up to 16% of the weight of cellulose decomposed (see also *Soils and Fert.* X, p. 284). The addition of 0.5-6.2% of colloids caused a marked increase in aggregation, and stability against falling drops was increased by up to 10 times. With particles <20 microns in diameter, 0.5% of colloid was as effective as 2% according to Bouyoucos' densimetric method, but with particles of 20 40 microns was about ½ as effective. In a surface horizon containing 4.4% of organic matter, the addition of 1% of colloid doubled the resistance to water impact; with deeper horizons this effect was much greater. In the period from the 10th to the 30th day after adding 2% of colloid, the coefficient of aggregation remained about the same for particles <20 microns but was halved for larger particles. For 4-mm. aggregates the resistance to water impact was halved between the 10th and the 65th day after adding 2% of the colloid.

[1675] 631.434 : 631.67
BUROV, D. I. **[Dynamics of the structure and dispersion of irrigated old arable and ley soils on an ordinary chernozem.]** *Pochvovedenie* 1949 (224-227). [R.]

Trenches of area 4 square m. were filled with a 20-cm. layer of sieved particles of sizes 3-1, 1-0.25 and 0-7 mm. from (a) old arable land and (b) a 3-year lucerne ley, the prepared areas being sown each spring with hard wheat and the arable layer completely turned by spade after harvest. Soil from (b) had a considerably larger percentage of water-stable aggregates and fewer small-grained elements than (a). Water-stable aggregates decreased and dispersion increased in the second as compared with the first year of the experiments. With (a), irrigation increased the number of dispersed particles by 2-3 times and decreased the water-stable aggregates by 15-20%, the corresponding figures for (b) being 1½-2 and 5-8%. Aggregate destruction was slowest with the soil particles of size 1-0.25 mm., reflecting the higher water-stability of the smaller aggregates.

[1676] 631.435 : 539.16
SIZOO, G. J.; HOOGTEIJLING, P. J. **Radioactivity and granular composition of soil.** *Physica* 13, 1947 (517-528). B.A. BI, 1949 (136).

Determination of radioactivity and measurements of particle-size distribution have been made in 12 samples from the bed of the Zuiderzee. As the radioactivity increased, the percentage of parts smaller than 50μ diameter increased. It is considered that the presence of radioactive elements is not necessarily restricted to a special size-fraction, but is related to the mineral composition of the smaller fractions. Zircon is found mainly within the small-size fractions and its presence may be correlated with the radioactivity.

[1677] 631.435.1 : 631.81
OPITZ, K. Düngungsversuche auf Sandboden. **[Fertilizer trials on sandy soil.]** *Z. PflErnähr. Düng.* 45, 1949 (232-244). [G.]

In 12 years of trials on a very acid sandy soil farmyard manure resulted in an improvement of the pH-values but green manure had an unfavourable effect. Deep ploughing caused good results even on this light soil and increased the effect of the applied lime,

but the farmyard manure was better utilized with shallow tilling. Highest yields were attained with the application of NPK, lime, farmyard manure and deep tilling. The unfertilized plots yielded nothing at the end of the trial period. Mineral fertilizing without organic fertilizer preserved high productivity for 9-10 years.—B.F.G.

[1678] 631.436 : 633.2.03
KAZAKOV, V. E. **[The influence of the density of a stand of perennial herbage on the temperature and moisture of the soil.]** *Pochvovedenie* 1949 (268-276). [R.]

Summer surface temperatures of a light chestnut soil at Alma Ata were about 5°C. lower under a dense (87%) herbage cover than under a lighter (75%) one. The temperature differences levelled out at about 10 cm. depth. The lower temperature of the densely-covered soil caused a decrease in evaporation and an increase in the moisture content of the 0-70-cm. layer of soil. The increase was somewhat irregular and not marked.

Irrigation lowered the soil temperature during the summer months by 10-11°C., and occasionally by 20-22°C. The fall in temperature was attributed not only to the higher moisture content of the soil, but also to the denser covering of plants on the irrigated soil.

631.44 SOIL TYPES

(*See also* Abs. Nos. 1913, 1930, 1964)

[1679] 631.44
MORALES, R. P. **Pedology.** *Rev. Soc. Cubana Ing.* 45, 1947 (196-217). C.A. 43 (3953).

Characteristics of soils at different altitudes and weather influences on soils are discussed, and soils are classified on the basis of solid particles of organic and inorganic origin, water content and aeration.

[1680] 631.44
BOTELHO DA COSTA, J. V. Notas acerca do sistema americano de classificação de solos. **[Notes on the American system of soil classification.]** *An. Inst. Sup. Agron. Lisboa* 16, 1949 (113-125). [Pt.]

The United States system as presented in the U.S.D.A. *Yearbook of Agriculture 1938* and, with some modifications, in the soil-classification symposium in the February 1949 number of *Soil Science* is described.

[1681] 631.44
WILDE, S. A. **Glinka's later ideas on soil classification.** *Soil Sci.* 67, 1949 (411-413). [Univ. Wis.]

The first edition of Glinka's book appeared in 1908 and is still often quoted as containing his ideas on soil classification, but the book was revised in 1915, 1922, 1924, 1925, 1926 and 1931. In the last edition the earlier classification is simplified; Glinka abandoned his original scheme based on soil development under optimum, average, insufficient, excessive and temporarily-excessive moisture and discarded the concepts of endodynamomorphic and ectodynamomorphic soils. He found the concepts of intrazonal and azonal soils artificial and superfluous. He suggested the classification of soil-forming processes and resulting soils into (1) lateritic types, including typical laterites, red earths of subtropical latitudes and red earths and yellow earths of warm temperate latitudes; (2) podzolic types; (3) steppe types including chernozems, chestnut soils, brown soils, serozems and red soils of subtropical desert-like prairies; (4) bog type including bog soils and solonchak soils; (5) solonetz soils.

[1682] 631.44 : 631.417.2
VOLOBUEV, V. R. **[Changes in the content of humus in soils of the U.S.S.R. in relation to climatic conditions.]** *Dokl. Akad. Nauk.* 50, 1948 (109-112). [R.]

The author (see *Soils and Fert.* X, p. 145) had already proposed a formula connecting precipitation (in mm.) and temperature (in °C.) of regions within which different soil types occurred, viz., $T = 43.2 \log P - H_t$, where T (temperature) and P (precipitation) are variables, and H_t a parameter having a definite quantity for each soil hydroseries of which six are distinguished—desert, serozem, chestnut, chernozem, podzolic, and gley-podzol.

Plotting quantity of humus in the surface soil against H_t, it is found that there is a sharp rise in the content of humus followed by a sharp fall in the H_t range 105-115, this range corresponding to the occurrence of chernozems.

[1683] 631.445.14 : 631.61
POLAK, B. De Rawa Lakbok, een eutroof laagveen op Java. **[The Rawa Lakbok, a eutrophic low moor in Java.]** *Landbouw* 21, 1949 (177-222). [Du.]

The Rawa Lakbok on the south coast of the Priangan Residency of western Java consists of a peat deposit with an area of 3000 ha. and a maximum depth of 6 metres. The area was originally impenetrable jungle and swamp, but in 1924 a reclamation scheme was carried out with native labour and some settlement occurred. The Rawa now includes reclaimed marsh and forest peat.

The peat is situated in a basin bordered on the north by high river banks (8-10 m.). It is built up of water and marsh plants with forest remains round the edge. During the growth of the peat the periphery was dry periodically whilst the middle was permanently under water. The succession of the plant communities is irregular and suggests that the water level has risen during the development of the peat. The pH of the peat is 5.4-6.0. A blue sticky clay underlies the peat. At 50-100 cm. depth there is an extensive layer of pure volcanic ash containing 0.55% of P_2O_5 and consisting of much plagioclase and vitreous material.

Since 1924 the jungle has been cleared and the area planted to rice; this is one of the few areas in Indonesia where rice is grown on peat soil. The crop is dependent on natural rainfall and no fertilizers are used. Yields vary from reasonably good to very poor, and average 1580 kg. of stalk rice per ha. Regulation of the water supply and rational manuring are recommended for improving the land.—K.S.

[1684] 631.445.52
LEBEDEV, YU. P. **[The depression-hillock solonchakous complexes: their origin and evolution.]** *Pochvovedenie* 1949 (228-240). [R.].

The *shor* (or depression) solonchak, the main component of the complex, occurs usually in very wide depressions where ground water high in salts of the $CaCl_2$ type lies near the surface. Such water in surface layers often occurs in anticlinal areas having dislocations serving as outlets to the surface and is high in iodine content, as are also the soils of these complexes. The hillock component of the complex is formed at or beyond the limits of the *shor* depression by wind erosion and subsequent deposition from the *shor*. Desalinization to a depth of up to 20 inches or more, accompanied by a decrease in size and a tendency to level-off, sometimes occurs in hillocks very distant from the blowing depression solonchak.

[1685] 631.445.55 : 631.459
BOSAZZA, V. L. **The desert landscape.** *Nature* 159, 1947 (478).

As many deserts occur in regions with quite copious rainfall, it is proposed to define a desert landscape as one where the rate of soil erosion exceeds the rate of soil formation.

[1686] 631.445.7 : 549.1
HELLMERS, J. H. Ergebnisse der mineralogischen Untersuchung einiger Tropenböden. **[Results of mineralogical studies of some tropical soils.]** *Z. PflErnähr. Düng.* 45, 1949 (159-165). [G.]

In conjunction with chemical analysis, microscopic investigation can offer valuable supplementary information and can often explain discrepancies between plant response and chemical and mechanical analyses of the soil.—B.F.G.

631.453/8 TOXICITY.

SOIL EXHAUSTION

[1687] 631.453 : 546.173
HENDE, A. VAN DEN Vraagstukken van stikstof-huishouding. 2de mededeling: De giftigheid der nitrieten voor onze cultuurgewassen. **[Problems of nitrogen economy. 2nd Communication: The toxicity of nitrites on cultivated plants.]** *Meded. LandbHoogesch. Opzoekingssta. Gent* 14, 1949 (91-110, 159-168). [Fl.e.]

The study of nitrites is important because of their reputed phytocidal properties and because small quantities of nitrites may be contained in nitrate fertilizers. There was pronounced injury after scattering 800 and 1000 kg./ha. of $NaNO_2$ on turnips and mangolds. 200 kg./ha. caused burning of turnips and wheat and 500 kg./ha. injured barley and sugar beet, but the yields were not badly affected.

[1688] 631.453 : 546.173

HENDE, A. VAN DEN ; SLAATS, M. Vraagstukken van stikstof-huishouding. 3[de] mededeling : De uitwerking van nitrieten op grasland. **[Problems of nitrogen economy. 3[rd] Communication : The effect of nitrite on grassland.]** *Meded. Landb-Hoogesch. Opzoekingssta. Gent* 14, 1949 (159-168). [Fl.e.]

During the years 1945-48, doses of 500 and 800 kg./ha. of $NaNO_2$ applied in summer caused severe burning of clover, weeds and grass and reduced the yield of the first cut. In the following cuts nitrite plots gave yields as high as the nitrate plots. 250 kg./ha. applied in spring did not cause burning and yields from the first cut were as high as from nitrate plots.

[1689] 631.458

BRONSART, H. VON Der heutige Stand unseres Wissens von der Bodenmüdigkeit. **[The present state of knowledge concerning soil sickness.]** *Z. PflErnähr. Düng.* 45, 1949 (166-193). [G.]

Soil sickness is defined as "the loss of suitability of soil as a substrate for a certain plant or a similarly-acting plant, due to the repeated cultivation of the plant, and the cause of which is unknown but plant-specific." At least 3 types occur in fruit-tree nurseries alone. The toxin (root secretion) and micro-organic (disturbance of soil micro-biological equilibrium by the constant presence of the rhizosphere of a monoculture) theories are discussed : they do not cover long-term sickness, e.g., of up to 60 years in some apple orchards, in causing which a minor-element impoverishment or unavailability may be involved. The fact that control may be effected by soil-sterilization methods (use of CS_2 or steam heat) may be due to the consequent release of minor elements into an available form and experiments in which CS_2 and other reducing agents such as formalin and $NaHSO_3$ were applied to soils showed great increases in the availability of the minor element studied (Mn). The surest means of prevention appears to be the use of rotations where practicable, including the use of arable land for new orchard plantings and the suitable rotation of fruit crops.

631.459 SOIL EROSION

(*See also* Abs. Nos. 1960, 1973, 1974)

[1690] 631.459 : 551.55

YAKUBOV, T. F. **[Soil erosion due to wind and its prevention.]** *Nauka Zhizn.* No. 5, 1947 (21-26). C.A. 43 (3549). [R.]

The consequences of sand or dust storms in respect of quantities of soil removed, epidemics caused and damage done to soil fertility, e.g., loss of P and K, are mentioned. The factors which determine the detrimental action of the wind, i.e., the geological conditions, type of soil and its chemical composition, formation, structure, micro-relief, moisture, vegetation, climate, etc. are discussed.

[1691] 631.459 : 551.55 : 631.434

PEERLKAMP, P. K. Bodemstructuur en winderosie in Z.O. Groningen. **[Soil structure and wind erosion in South-East Groningen.]** *Maandbl. LandbVoorlD.* 1948 (512-517). [Du.]

Aggregate analysis (wet-sieving method) was applied to wind-eroded and normal plots in 1947, and factors such as cultivation, water percolation, organic-matter status, etc., were investigated. In 1948, 48 plots were laid out, on 27 of which there was blowing. Rye was grown on all the plots.

The results showed that non-blowing soils are moister than blowing soils. In the 0-2-cm. layer the average moisture content was 38.0% in the non-blowing, and 13.8% in the blowing soil. The data for the 5-10-cm. layer are confirmatory. The results are highly significant. The smaller the content of the fraction $<$0.3 mm., the better is the binding of the soil particles, and the more stable the structure. The binding effect is ascribed to a metabolic product of micro-organisms, called stable humus.—K.S.

[1692] 631.459 : 631.472

OLSON, O. C. **Relations between soil depth and accelerated erosion on the Wasatch Mountains.** *Soil Sci.* 67, 1949 (447-451). [Intermountain Forest and Range Expt. Sta.]

The dissected western slopes of the Wasatch Mountains in Utah rise abruptly from the valley of the Great Salt Lake at 4,200 feet to peaks of 8,500-11,000 feet. Soils are residual, modified by colluvial effects,

and uneroded surfaces are deep, friable, stony, granular and high in organic matter. Annual precipitation varies from 16 in. at the foot of the mountains to 30 in. higher up. Vegetation is mainly mountain brush, sagebrush, aspen and conifers. 10% of the area is naturally barren.

The area is used mainly for water production, and grazing is of secondary importance. Slightly sheet-eroded soils have lost 25% of their top soil, moderately eroded have lost 25-75% and severely eroded more than 75%. Gully erosion is associated with all three types. Shallow soils or soils with tight subsoils are more severely eroded than are deeper, more friable types, because of limited root space and less available moisture. 68% of the area has only slight or no apparent erosion. All the accelerated erosion occurs on areas occupied by sagebrush, grass or weeds and on some mountain brush of low density. There is little erosion on soils of the conifer, aspen, heavy mountain-brush areas making up 65% of the area. 71% of the soils are deep and friable; only 1% of this area has severe erosion and 14% has moderate erosion. 30% of the shallow friable soils with permeable subsoils, 16% of the deep soils with tight subsoils and 40% of the shallow soils with deep subsoils are severely eroded; 66%, 18% and 19% respectively are moderately eroded.

[1693] 631.459 : 631.582

Cablík, J. **[The theoretical solution of problems of protecting soil against water erosion.]** *Interagra* 3, 1949 (72-81). [R.e.]

A complicated formula is deduced showing the relationship between the dynamic energy of run-off water, the degree of slope and the distance from the watershed. Another formula gives the optimal width of strips in strip cropping.

[1694] 631.459 : 631.589

Rowe, P. B. **Influence of woodland chaparral on water and soil in Central California.** *Calif. Dept. Nat. Resources, Div. Forestry* 1948, pp. 70. For. Abs. 10 (294).

Measurements of surface run-off, erosion and water yield were made during 9 years on 3 sets of plots: (1) burned annually, (2) burned twice in the 9 years and (3) left undisturbed. Run-off from (1) averaged 14%, from (2) 2% and from (3) 0.1% of precipitation. Average annual erosion rate in lb./acre was 25,000 for (1), 1000 for (2) and 1.5 for (3). A large part of the surface run-off and erosion from (2) occurred during the 2 years immediately after burning. Infiltration capacity of the soil on (1) was reduced by more than 95% during the first 3 or 4 years of burning; thereafter more than 75% of the rainfall produced run-off from these plots. On (2) the average infiltration capacity was reduced 80% by the first burning; infiltration capacity gradually increased between burnings, but the second burning resulted in a 90% reduction on the initial infiltration capacity. On (3) the average infiltration capacity was greater than the highest rainfall rates. Over a period of 4 years, vegetation on (3) used 2 inches more water per year than that on (1), but this was offset by greatly increased flash flows of silt-laden water from (1).

Erosion pavement and fluctuations in soil moisture are discussed.

[1695] 631.459 : 631.61

Hays, O. E.; McCall, A. G.; Bell, F. G. **Investigations in erosion control and reclamation of eroded land at the Upper Mississippi Valley Conservation Experiment Station, near La Crosse, Wis., 1933-43.** *U.S.D.A. Tech. Bull.* 973, 1949, pp. 87.

The results are applicable to the hilly unglaciated grey-brown podzolic loess above limestone and sandstone of the Upper Mississippi Valley, mainly of the Fayette series. The precipitation is 31 inches, and up to 90% of the annual soil loss is due to 4 or 5 intense storms. 50% of the cropland has lost more than half of its surface soil, resulting in some seeding down to pasture. Maize, grain and hay yields on severely eroded soil are about 70, 60 and 90% respectively as much as on moderately eroded soil and the run-off is 1.7 times as great. A dense cover of bluegrass or of timber protected from fire and grazing prevented erosion and run-off even in the severest storms. The 3-year rotation maize, grain, hay, allowed only ⅓ of the soil loss compared with continuous maize, but did not give adequate control on a 16% slope. The addition of organic matter greatly reduced soil loss, carbonaceous material having

more lasting effects than nitrogenous. Strip cropping with 2 or more years of hay in a 6-year rotation effectively controlled erosion where the slope was not too long. Soil losses were excessive from the lower strips of a 300-foot-long slope. Terraces with 7-foot vertical spacing and a 3 inch grade per 100 feet in channel did not control erosion on 10% slopes unless the rotation included 2 years of hay. The loss of water and nutrients by percolation from Fayette silt loam was low and decreased with the density of cover.

[1696] 631.459 : 631.61
HEIMPEL, L. G. **Engineering phases of water erosion control.** *Agric. Inst. Rev.* 4, 1949 (226-233). [Dept. Agric. Engng., Macdonald Coll. P.Q.]

[1697] 631.459 : 631.61 : 33
PRÉAUD, R. Sur la conservation des sols. **[Soil conservation.]** *C.R. Acad. Agric.* 35, 1949 (371-374). [F.]

A presentation, with following discussion, of the thesis that in general only hereditary proprietors will fully apply soil-conservation measures, which imply the sacrifice of immediate returns in the interest of posterity.

[1698] 631.459 : 634.9
HAASE, H. **Effect of deforestation in the Harz on water collection and soil erosion.** *Gas- u. Wasserfach* 89, 1948 (265 269). B.A. BIII, 1949 (142).

The peak flow of the Radau has been increased by 31% as a result of deforestation in the valley.

631.46 SOIL MICROBIOLOGY

(*See also* Abs. Nos. 1630, 1643, 1661, 1672, 1673, 1674, 1795, 1826)

[1699] 631.461 : 553.97
RYBALKINA, A. B. **[The microflora of peat and its relationship to *Azotobacter chroococcum* and higher plants.]** *Pochvovedenie* 1949 (193-204). [R.]

The effect on *Azotobacter* of the bacteria of peats was studied by a method analogous to the Novogrudsky-Khudiakov-Kononenko method in isolating from soil the bacteria antagonistic to various fungi. All the bacteria obtained were species of *Pseudomonas* or *Achromobacter*, and were grouped into those (a) antagonistic to, (b) stimulating to and (c) without effect on *Azotobacter*. The majority of (c) were *Achromobacter* spp., and of (a) *Pseudomonas* spp. Antagonistic activity was strongest in the early growth stages of *Azotobacter*, in its rod and coccus forms. This division into the 3 groups, based on the effects on *Azotobacter*, in no way resembled the grouping of the bacteria in respect to their effects on the growth of and yield from wheat seeds treated with them.

[1700] 631.461 : 576.809.7
MAY AND BAKER LABORATORIES. **Report on the antibiotic properties of certain soils in British Guiana.** *Bull. Imp. Inst.* 46, 1948 (353-355).

Experiments have shown that an alluvial clay loam, a light-brown sandy soil from an old river terrace, a white quartz sand with impeded drainage at depth and a brown loam soil possess some antibiotic activity, but it is not yet possible to state to which micro-organisms the activity is due.

[1701] 631.461 : 581.144.2
CANADA DEPARTMENT OF AGRICULTURE. **Distribution of micro-organisms in the rhizosphere and rhizosphere effects of different crop plants.** *Canada Dept. Agric. Sci. Serv. Rept. 1947-48*, 1948 (32-33).

When the microbial population was estimated on the basis of numbers per unit of rhizosphere soil, bacteria and fungi decreased with distance from the base of the tobacco stem in both horizontal and vertical directions. However, expressed on the basis of unit root weight the numbers increased with horizontal distance, and with vertical distance to a depth of 10 inches, after which a decrease was noted. Cellulose-decomposing and denitrifying bacteria were more abundant in the rhizosphere of the older parts of the root system. On the other hand, proteolytic and ammonifying organisms, and particularly nitrifying bacteria, were more abundant in the rhizosphere of the younger root portions. Bacteria requiring amino acids for maximum growth were relatively more abundant in the rhizosphere of the younger roots (more distant from the stem) than in soil adjacent to the older parts of the root system.

In various crops, both with seedlings and older plants, bacteria with simple requirements, as well as those requiring amino acids for growth, were preferentially stimulated

in the rhizosphere; organisms requiring more complex nutrients, such as provided by soil extract, were relatively suppressed. Some specific effects of the crop were noted.

[1702] 631.461 : 581.144.2
VOZNIAKOVSKAIA, YU. M. **[The influence of the root system of wheat on the soil micro-flora.]** *Mikrobiologia* 17, 1948 (458-462). [R.] [Moscow]

Counts were made of numbers of all micro-organisms, denitrifiers, cellulose-decomposing organisms, *Clostridium Pasteurianum*, fungi, certain types of *Achromobacter*, actinomycetes, etc., in the rhizosphere of (1) living roots and (2) dead roots, and (3) in the soil some distance from the root system at four stages of growth-tillering, beginning of stem formation, earing and ripening.

The total numbers of micro-organisms were much higher in the rhizosphere of living roots than in the other two cases, which were not markedly different. Living roots, as compared with dead roots, seemed specially to favour the development of denitrifiers, *Clostridium*, fatty-acid bacteria and *Achromobacter*, and it is suggested that the roots may excrete a substance which promotes growth of these organisms. In the rhizosphere of dead roots cellulose-decomposing organisms which take part in the decomposition of the dead roots are promoted. This phenomenon actually begins at the period of ripening when the roots are still alive but are beginning to die off. Actinomycetes and fungi are not quantitatively affected by the root system of wheat.

[1703] 631.461 : 581.144.2 : 631.432.2
CLARK, F. E. **Rhizosphere microflora as affected by soil moisture changes.** *Proc. Soil Sci. Soc. Amer. 1947*, 12, 1948 (239-242). [Bur. Pl. Indust., U.S.D.A.]

Greenhouse experiments were carried out on soybeans grown in fertile loam. Different moisture contents in one series were kept constant and in the other were drastically changed just before sampling. Root material and microbial populations of corresponding rhizosphere samples were compared. The experiment was extended to 10 other plant species.

In drier soils, much higher microbial numbers occurred than in wetter ones. Recoverable root material correlated well with microbial population but both these factors gave negative correlation with soil moisture. Liberal watering of nearly dry soil immediately before sampling reduced microbial density.

[1704] 631.461 : 631.416 : 631.557
WHITE, J. W.; HOLBEN, F. J.; JEFFRIES, C. D. ET AL. **Correlation of microbiological and chemical soil data with crop yields of the Jordan soil fertility plots.** *Soil Sci.* 67, 1949 (279-285).

These correlations are expressed in terms of Pearson product-moment correlation coefficients. The soil samples were taken after maize harvest at the end of 50 and 54 years of continuous cropping. Microbiological activity as measured by the cellulose-decomposing power and nitrifying capacity, total soil N and organic C and readily available P and nitrate N showed significant correlation with crop yields. None were found to exist between yields and exchangeable K and inorganic water-soluble salts.

[1705] 631.461 : 631.43
STÖCKLI, A. Der Einfluss der Mikroflora und Fauna auf die Beschaffenheit des Bodens. **[The influence of microflora and fauna on soil conditions.]** *Z. PflErnähr. Düng.* 45 1949 (41-53). [G.]

The activities of the microflora and fauna, especially of earthworms are reviewed, and the author presents estimates of the quantity of chemical decomposition effected by the soil fauna and flora.—B.F.G.

[1706] 631.461 : 631.432.4
BHAUMIK, H. D.; CLARK, F. E. **Soil moisture tension and microbiological activity.** *Proc. Soil Sci. Soc. Amer. 1947*, 12, 1948 (234-238). [Iowa St. Coll., Ames, and Bur. Pl. Indust., U.S.D.A.]

Bacterial and fungal activities were estimated by the rate of CO_2 evolution. At the moisture tension of 3,160 cm. of water sandy soils contained a maximum of fungi and silty clay a maximum of bacteria. Soil texture therefore not only determines water retention but also apparently influences the nature of the microflora and hence the course of biological decomposition.

Moisture tension giving maximum CO_2 was approximately 3,160 cm. for Thurman sand, 502 cm. for Clarion loam, 50 cm. for

fine sandy loam, 10 cm for Wabash silty clay, and 1 cm. for Webster silt loam. In all cases the peak rate of CO_2 production occurred at or near moisture tension at the aeration porosity limit (by convention, 50 cm. of water). Sand gave exceptionally small differences between CO_2 production rates at 50, 502, and 3,160 cm. tension.

[1707] 631.461 : 631.434
NOVOGRUDSKY, D. M. **[One manifestation of the anti-microbial properties of soil.]** *Mikrobiologia* 17, 1948 (193-200). [R.] [Soil Inst., Alma-Ata]

The anti-microbial activity of soil fractions 0.5-0.25, 0.25-0.125 and <0.125 mm. was determined by counting the proportion of soil particles of samples of each fraction incubated on agar that did not develop fungi or actinomycetes. Most of the anti-microbial activity was found in the finest fraction, especially when the particles were closely packed. Heat sterilization greatly reduced anti-microbial activity, but it was possible to regulate sterilization so that anti-fungus activity was destroyed while anti-actinomycete activity was almost unimpaired.

The anti-microbial activity of the fine soil particles can be explained most generally by the fact that the larger particles, and especially soil aggregates, are better habitats for micro-organisms. This is an additional reason for promoting ley farming and the creation of a stable crumb structure in the soil.

[1708] 631.461 : 631.445.55
FEHÉR, D. Der Wüstenboden als Lebensraum. Bericht der französisch-ungarischen Sahara-Expedition im Jahre 1936. **[Desert soil as a habitat. Report of the French-Hungarian Sahara expedition of 1936.]** *Mitt. Bot. Inst. Univ. Sopron* 10, 1946, pp. 128. [G.f.]

68 soil samples taken from the main soil types over the 2000 km. between Algiers and Agades (Niger Colony) were studied for microfloral content and respiration. Bacteria of 98 spp., microscopic fungi of 28 and algae of 84 spp. were isolated and soil respiration studies showed most of them to be active. While the number of micro-organisms was least in the extreme desert soils, micro-organisms, especially fungi, were frequently found in soils too dry to lose weight on heating. All the new bacterial species found some years before were again found over the whole distance. In the true deserts, spore-forming bacilli and actinomycetes were predominant and nitrifying and denitrifying bacteria were always present. *Aspergillus* and *Penicillium* spp. were the most common fungi and *Syncephalestrum* and *Trichoderma* spp. occurred often.

Almost all the soils contained fair amounts of available P, K and nitrate-N. The desert soils were specially low in humus, the oasis and steppe soils showing the highest values. Total-salt content was usually below 1% except in the lake-bottom soils (*schotts*).

[1709] 631.461 : 631.557
KRASILNIKOV, N. A. **[Soil micro-organisms and crop yields.]** *Mikrobiologia* No. 2, 1949 (49-58). [R.] [Inst. Microbiol., Moscow]

The rhizospheres of different plants have different populations, and it is thus possible to arrange cropping sequences so that the microbial population left by the preceding crop has a favourable influence on the succeeding crop—e.g., lucerne promotes the development of bacteria which destroy the causative organism of cotton wilt. It is suggested that the art of "bacterization" of seeds and soils so as to destroy pathogenic organisms is capable of great practical development. An example is given of an unnamed bacterium which, when inoculated onto pine seeds, checked attacks by *Fusarium*. Antibiotics, when applied to soil, are destroyed, but they can be effective when the micro-organisms producing them are present.

Evidence has been obtained that some plants contain antibiotics distributed variously in different parts. Penicillin, streptomycin and mycetin have been found in lucerne and peas. It is possible that these may play a role in protecting plants from pathogens.

[1710] 631.461 : 632.951
SMITH, N. R.; WENZEL, M. E. **Soil micro-organisms are affected by some of the new insecticides.** *Proc. Soil Sci. Soc. Amer. 1947*, 12, 1948 (227-233). [Bur. Pl. Indust. Beltsville, Md.]

No definite injury to soil micro-organisms resulted from experimental use of D.D.T. at rates varying from 10 up to 400 lb./acre.

In some cases slight damage occurred, followed by recovery. The same held for p.p. prime DDT (100%). Fungicidal action was recorded for benzene hexachloride containing 10-12% of γ isomer, used at 100 and 500 lb./acre. This substance also considerably reduced nitrifiers, which were not protected from it by the presence of cottonseed meal. Chlordane proved less toxic in both respects. Chlorinated camphene was beneficial to bacteria and fungi. Its apparent inhibitory action on nitrifiers was possibly due to increase of heterotrophs.

[1711] 631.461 : 633.912
BLAKE, J. T.; KITCHIN, D. W. **Effect of soil microorganisms on rubber insulation.** *Indust. Agric. Chem.* 41, 1949 (1633-1641). [Simplex Wire and Cable Co., Cambridge, Mass.]

Some of the rare failures of non-leaded rubber-insulated underground cables are caused by soil micro-organisms, but the exact mechanism of attack is not known. Natural rubber is more susceptible than synthetic rubber.

[1712] 631.461.1/3 : 631.416
BÉTRÉMIEUX, R. Fermentation des matières organiques et dynamique chimique du sol. **[The fermentation of organic matter and the chemical dynamics of the soil.]** *C.R.* 228, 1949 (1749-1751). [F.]

The amounts are recorded of SiO_2, Fe_2O_3 and CaO in the filtrates obtained by daily percolation in the laboratory of mixtures of soil and quartz sand with a solution of glucose + an NH_4 salt. An early rapid exhaustion of exchangeable-Ca reserves due to exchange with NH_4 and to increasing acidity due to fermentation is succeeded by a period lasting until about the 45th day, during which Ca and considerable quantities of Fe are lost simultaneously; after this time the losses of Ca and Fe become much less. SiO_2 was at first lost very slowly, the quantities dissolved then becoming fairly constant but much less than those extracted in the determination of free Fe oxide by the oxalic method. It is thought possible that the fermentations can cause attack of the markedly crystalline forms of Fe such as haematite as well as the less crystalline, and may thus play an appreciable part in the weathering of minerals and rocks.

[1713] 631.461.4
KORSAKOVA, M. P. **[Denitrifying bacteria.]** *Mikrobiologia* 17, 1948 (488-501). [R.]

A review of 79 listed papers.

[1714] 631.461.51
MALTSCHEWSKY, N. Über die Anpassungsfähigkeit von Azotobakter chroococcum und deren Ausnützung in der landwirtschaftlichen Praxis. **[The adaptability of *Azotobacter chroococcum* and its utilization in agricultural practice.]** *Z. PflErnähr. Düng.* 42, 1948 (241-267). [G.] [Karlsruhe]

A high degree of adaptability of *A. chroococcum* to different habitats was observed. When other substances than sugar, etc., were being used as a C-source, a temporary decay of the normal *Azotobacter* cells (dissociation) into small roundish or longish forms occurred. The utilization of raw potato peelings and other kitchen wastes by *Azotobacter* was very satisfactory and its N-fixing ability was retained. (17 mg. of N in 20 days in 1 g. of potato peelings by inoculation with 16 million *Azotobacter* cells). Prepared composts of vegetables and fruit residues also showed a good development of *Azotobacter*. The organism returned to its normal form after the dissociation period. In pot experiments in which *A. chroococcum* was applied to the soil and the seed with or without potato peelings, the *Azotobacter* count was by far the greatest when the organism had been applied to the soil together with peelings.

[1715] 631.461.51 : 581.144.2
MESHKOV, N. V. **[The effect of azotobacter on the yield of agricultural crops in connexion with the root excretions of plants.]** *Sovet. Agron.* No. 3, 1949 (85-92). [R.]

The capacity of plants to maintain sufficient azotobacter in the rhizosphere to meet their own requirements during growth depends on the composition of their root secretions. The most important factor is the carbohydrate content of the root secretions as this determines the N-fixing capacity of azotobacter. In these experiments in nutrient solutions, different plants such as peas and maize varied considerably in the total carbohydrate content of their root secretions.

[1716] 631.461.51 : 631.461
VOZNIAKOVSKAIA, YU. M. **[The role of *Clostridium Pasteurianum* as a factor increasing the effectiveness of bacterization of seed with azotobacter.]** *Mikrobiologia* 17, 1948 (389-394). [R.] [Inst. Agric. Microbiol., Moscow]

Evidence was obtained that the influence of *Clostridium Pasteurianum* on N fixation was more the result of its increasing the growth of azotobacter than of direct N fixation. Growth of azotobacter in mixed cultures of *A. chroococcum* and *C. Pasteurianum* was 2-10 times as great as in pure cultures of azotobacter, and considerably more N was fixed by mixed cultures. In pot experiments inoculation of seeds of millet and wheat with mixed cultures produced higher yields than did inoculation with pure cultures.

[1717] 631.461.52 : 547.963.4
VIRTANEN, A. I.; ERKAMA, J.; LINKOLA, H. **On the relation between nitrogen fixation and leghaemoglobin content of leguminous root nodules. II.** *Acta Chem. Scand.* 1, 1947 (861-870). [E.] [Biochem. Inst., Helsinki]

Comparative experiments with 13 different strains of pea bacteria and 6 strains of horse-bean bacteria showed that there is a positive correlation between the amount of haematin per g. of nodules and N fixation. There was only a slight relationship between the amount of haematin per plant and N fixation. Similar results were obtained with soybeans. There was no distinct correlation between Fe content of the nodules and N fixation. See also *Soils and Fert.* XII [480].

[1718] 631.461.52 : 631.461.4
WILSON, J. K. **The legume bacteria liberate gaseous nitrogen from nitrate.** *Proc. Soil Sci. Soc. Amer. 1947*, 12, 1948 (215-216). [Cornell Univ., N.Y.]

It has been known for a long time that nitrous acid in acid solutions may liberate gaseous N; this probably occurs where any substance is present whose potential is low enough for the nitrous acid to oxidize it. It was first shown to occur in acid solutions containing amines. To test the ability of the legume bacteria to reduce nitrous acid, agar slopes of a suitable nutrient medium, containing nitrate, were inoculated with Rhizobia and after about 3 days' incubation a plug of the melted medium was poured over the growth. Gas appearing during the next two days was collected by liberating it under water under an inverted funnel, and was found to be N. It seems probable that the liberation of N is not usually detected because of the small amounts of nitrite present. All the strains tested behaved in the same way when placed in these artificial conditions. It is unlikely that the reaction would occur in a healthy nodule.—L.M.C.

[1719] 631.461.52 : 631.461.74
VIRTANEN, A. I. **Biological nitrogen fixation.** *Ann. Rev. Microbiol.* 1948 (485-506). [Biochem. Inst., Helsinki]

Work done during the current decade is discussed under the following heads: Mechanism of N fixation, haemoglobin in root nodules, N fixation by blue-green algae, and antibacterial effect of soil microorganisms on N-fixing bacteria. *Bacillus mesentericus* effectively prevents the growth of legume bacteria and *Azotobacter*. In autoclaved samples of soil rich in organic matter inoculation with legume bacteria did not induce growth; a bacterium of *Bacillus mesentericus* type isolated from the samples had an antibacterial effect on all tested strains of rhizobia from pea, clover, *Phaseolus* and *Azotobacter*. On many soil bacteria tested the bacillus had no antibacterial effect.

[1720] 631.461.74 : 631.851
PIKOVSKAIA, R. I. **[Mobilization of phosphates in soil in connexion with the vital activities of some microbial species.]** *Mikrobiologia* 17, 1948 (362-370). [R.]

Evidence was obtained, from bacterial cultures on phosphorite, of the existence in soils and phosphorites of bacteria capable of actively decomposing $Ca_3(PO_4)_2$ with formation of water-soluble phosphate. Similar cultures of azotobacter, clostridium and nitrifying organisms produced phosphate soluble in 0.002 n. H_2SO_4, but not in water. Pot experiments with oats inoculated with cultures of different organisms showed increases in green matter after two months of 90-245% from inoculation with azotobacter, clostridium and nitrifying organisms, and of 600-1100% from inoculation with the phosphate-decomposing "bacterium P." Increased uptake of P was 50-140%, and 300-1550% respectively. Bacterium P is regarded as a promising new bacterial fertilizer.

[1721] 631.462
AGRICULTURAL GAZETTE, NEW SOUTH WALES. **Sterilization of soils in glasshouses.** *Agric. Gaz. N.S.W.* 60, 1949 (251-253).

The use of steam sterilization using the spike-harrow system, formalin, DD and chloropicrin is discussed.

[1722] 631.462 : 547.581.2
MESHKOV, N. V. **[The toxic action on plants of products formed in podzolized soils by heating.]** *Pochvovedenie* 1949 (296-301). [R.]

In the belief that the depressing effect sometimes observed on yields from heat sterilization of soil was caused by formation of benzoic acid, pot experiments were made in which maize, buckwheat and mustard were grown in heat-sterilized and unsterilized soils to some of which dilute solutions of benzoic acid were added. The sterilized soils gave higher yields of maize than the unsterilized, and the benzoic acid caused larger yield depressions in the sterilized soils. No buckwheat or mustard was obtained from the benzoic-acid-treated pots, but in the year following treatment the treated soils yielded 2-3 times as much buckwheat as the untreated. In the third year, yields on the treated soils were normal. The benzoic acid did not alter the pH of the soil.

In another experiment, sterilization completely eliminated the yield of mustard, but addition of 4 g. of $CaCO_3$ restored the yield to that of the control. Further $CaCO_3$ had no effect on yield. It is concluded that the $CaCO_3$ neutralizes the harmful acids produced by sterilization.

[1723] 631.466.1 : 631.461
NOVOGRUDSKY, D. M. **[The colonization of soil bacteria on fungal hyphae.]** *Mikrobiologia* 17, 1948 (28-35). [R.] [Soil Inst., Alma-Ata]

The movement and settlement of soil bacteria on fungal hyphae are common phenomena in soils. The bacteria must be mobile and capable of settling on fungi. Both bacteria and fungi exhibit considerable specificity in this respect. Bacteria that most readily settle include *Pseudomonas fluorescens*, *Achromobacter denitrificans*, *Bacterium coli*, and to a lesser extent *Proteus vulgaris*, *Bacillus mesentericus* and *B. subtilis*. Species incapable of settling include *B. mycoides*, *B. megatherium*, *Micrococcus candicans* and *Sarcina lutea*.

The movement of bacteria along the hyphae is conditioned by the presence round the latter of microscopically thin films of water. Some fungi (e.g., *Penicillium*) excrete bacteriostatic substances into the water film, others (e.g. *Ambliosporium*) bacteria-stimulating substances.

The colonization of bacteria on fungal hyphae produces a bacterial "sheath" and anaerobic conditions round the hyphae which consequently die and decompose or undergo lysis. The whole process is probably one of the most important factors regulating the activity of soil fungi.

[1724] 631.466.1 : 631.461.1/3
DAWSON, R. C. **Decomposition of wheat straw by some fungi commonly found in Nebraska soils.** *Soil Sci.* 67, 1949 (467-479). [U.S.D.A. and Nebr. Agric. Expt. Sta.]

The constituents of straw most susceptible to microbial decomposition are cellulose and the hemicelluloses. In this study of aerobic decomposition, CO_2 evolution was the most reliable method of measuring or comparing rates of decomposition. Decomposition varied with the kind of fungi involved; oxidase-positive fungi were more active than oxidase-negative ones and cultivations of *Aspergillus* were more active than other oxidase-negative fungi. During decomposition there was high correlation between CO_2 evolution and loss of weight, but there was no correlation between CO_2 evolution and changes in pH. NH_3 losses from wheat straw during decomposition by pure or mixed cultures were negligible.

[1725] 631.466.1 : 633.13
STRZEMSKA, J. Zagadnienie mikoryzy u zbóż. Cz. I. Owies. **[The problem of mycorrhiza in cereal plants. Part I. Oats.]** *Państw. Inst. Nauk. Gospod. Wiejsk. Puławy* 1949, pp. 5. (Mimeo.) [Pl.e.]

Alluvial soils, podzol, loess, rendzina and sandy soils and their influence on mycorrhiza formation have been studied. Mycorrhiza formation in oats does not depend on the nature of the soils or on their pH.

[1726] 631.466.2 : 576.809.7
GOŁEBIOWSKA, J. Charakterystyka promieniowców antybiotycznych izolowanych z niezyznych gleb. **[Characteristics of antibiotic actinomycetes isolated from infertile soils.]** *Ann. Univ. Mariae Curie-Skłodowska* 3E, 1948 (207-219). [Pl.e.]

23 strains of *Streptomyces* have been isolated from infertile peaty and alluvial soils. Different biochemical properties of all the strains investigated are described; they seem to be correlated with the antibiotic activity.

[1727] 631.467.1 : 631.81 : 631.86
SINGH, B. N. **The effect of artificial fertilizers and dung on the numbers of amoebae in Rothamsted soils.** *J. Gen. Microbiol.* 3, 1949 (204-210). [Rothamsted]

Total numbers and numbers of active amoebae in plots treated with complete fertilizer + $(NH_4)_2SO_4$ and with farmyard manure were much higher than in untreated plots. The complete-fertilizer plot had a lower total count than the farmyard-manured plot, although there was no significant difference between the counts of active amoebae. No correlation was found between the percentage of organic C in the soils and the number of amoebae.

631.468 SOIL-FAUNA

[1728] 631.468 : 631.48
KRUPENIKOV, I. A.; STEPANITSKAIA, S. M. **[The influence of the marmot (*Marmota bobae* Müll) on the soil with reference to some features of its ecology.]** *Zool. Zh.* 22, 1943 (369-373). Biol Abs. 23 (316). [R.]

The marmot plays a significant role in soil formation, enriching the soil in carbonates and easily soluble salts. This results in the appearance of vegetation characteristic of more southerly semi-desert areas than N.W. Kazakhastan where the subject was studied.

631.48 SOIL FORMATION

[1729] 631.48 : 553.97
PIAVCHENKO, N. I. **[The genesis of the hummocky relief of peat lands in the north-eastern part of European Russia.]** *Pochvovedenie* 1949 (276-284). [R.]

Following a discussion of the literature it is concluded that these peats are not a special phenomenon. but evolve normally from flatland peat. This latter type is the usual one and any divergencies noted in different latitudes are evolutionary stages brought about primarily by the effect of frost causing the formation of cracks and by erosion.

Judging from the pollen analysis of the basic peat of these hummocks six phases in their ecological development can be distinguished :— (1) Beginning of peat formation—accumulation of only slightly decomposed peat; tundra landscape with predominance of birch. (2) Deposits of mainly sedge peats. Conifers. (3) Increase in peat formation. Moist climate, warmer than at present. Conifers definitely displacing birch. (4) Slowing-down of peat formation owing to drying-up of peat. increased decomposition. Increase in birches and pine, decline of spruce. Continental climate, colder than in the previous phase. (5) Considerably colder. Freezing of peat and formation of frost cracks. Tundra vegetation. (6) Contemporary period. Warmer climate. Gradual thawing of peat and degradation of peat hummocks. Sphagnum-hypnum moss peat formation. Northward movement of conifers, decline in birch distribution. Gradual cessation of water-erosion processes.

[1730] 631.48 : 626.34
ZEMLIANITSKY, L. T. **[Soil formations on canals near Petrov Val in the Kamyshinsk region.]** *Pochvovedenie* 1949 (285-295). [R.]

A survey of canal-embankment soils led to the conclusion that during 250 years the soils formed in slight depressions on the embankment had evolved into soils closely resembling the original zonal soils.

[1731] 631.48 : 63
YARKOV, S. P. **[The nature of the process of soil formation.]** *Pochvovedenie* 1949 (249-255). [R.]

Mainly an exposition of the views of V. R. Williams who emphasised the essentially biological nature of soil formation and maintained that the different genetic soil types were expressions of different stages of a single universal soil-forming process. The chief feature of this process is the synthesis and decomposition of organic matter that gives to the soil its unique characteristic of fertility. Fertility being thus the chief

object of the pedologist's attention, pedology can only be studied as a branch of practical agriculture. The effect of soil formation is to introduce what Williams called the "minor biological cycle of mineral and nitrogen nutrition of plants" into the cycle of weathering, resulting from the absorption of solar energy by the soil and its transformation into fertility, and giving the possibility of an almost unlimited increase in fertility by the adoption of appropriate agricultural measures.

631.5 CULTURAL OPERATIONS

[1732] 631.51
FRESE, H. Probleme der Bodenbearbeitung. **[Problems of soil cultivation.]** *Ber. Landtech.* 3, 1948 (33-43). [G.] [K.T.L. Forschungsstelle, Ulm]

After 100 years of implement development, more than half of Germany's cultivated soils are in poor condition and improved cultivation methods would greatly increase yields. Tyre-slip and compaction by tractor wheels are main causes of poor soil condition, and these factors would, with present gear, become intensified where narrower furrowing, subsoil loosening and 2-layer cultivation were applicable. The applicability of these cultural measures themselves can be determined only after effective study of implement kinematics and of the effects obtainable by implements on the most varied soil-structural conditions.

631.58 AGRICULTURAL SYSTEMS

(*See also* Abs. No. 1957)

[1733] 631.582 : 631.81
OHLROGGE, A. J. **An experiment designed to determine where in rotation to apply fertilizers.** *Proc. Natl. Joint Ctee. Fert. Appl.* 23, 1947 (217-222).

In a 4-year rotation of maize, soybeans, wheat and clover-lucerne hay, all crops but soybeans responded to 0-12-12 fertilizer. Wheat showed no difference between times of application. Higher yields of maize were obtained by applying $\frac{1}{3}$ of the fertilizer to maize and $\frac{2}{3}$ to wheat, or $\frac{1}{6}$ to maize, $\frac{1}{6}$ to soybeans, $\frac{1}{3}$ to wheat and $\frac{1}{3}$ to clover than by applying $\frac{1}{3}$ to soybeans and $\frac{2}{3}$ to clover. The farther in the rotation the fertilizer application was removed from the soybeans, the greater was the response to the second application of fertilizer. When K deficiency occurs, ploughing under of fertilizer high in K increases yield.

[1734] 631.582 : 631.841.5
ARENZ, B.; SCHROPP, W. Fruchtfolgeversuche mit steigenden Stickstoffgaben in Form von Kalkstickstoff. **[Rotation experiments with increasing applications of nitrogen in the form of cyanamide.]** *Beitr. Agrarwiss.* 2, 1948 (12-19). [G.]

Summer and winter wheat, rape, poppy, fodder and sugar beet, potatoes and catch crops received a basal fertilizing averaging 76.1 kg./ha. of P_2O_5+140.3 kg./ha. of K_2O+a cyanamide application averaging 35.2 or 70.4 kg./ha. of N. The results for 1938-44 show yield increases due to N of 15-54% with cereals, 13-90% with oil crops and 33-68% with row crops over the controls without N, which themselves produced good crops. Calculation of the production per unit of this N fertilizer, especially of the higher application, indicates that not only the yield but the economic returns also are increased. Row and oil crops utilized the N of the double application even better than that of the single. The cyanamide treatment only slightly decreased soil acidity, and liming was necessary.

[1735] 631.584
SCHUPHAN, W. Ein Beitrag zur physiologischen Wirkung einer Pflanze auf die andere. Gemüseversuche im Allein- und Mischanbau. **[The mutual physiological influence of plants. Studies in single and mixed cropping of vegetables.]** *Bot. Oecon.* 1, 1948 (1-15). [G.e.f.r.]

Yields of carrots and peas were not affected by mixed cropping in field or pot experiments, except that carrots in actual contact with pea roots in pots gave larger yields. The absence of any effect of gaseous material from carrot roots on pea yields is attributed to absorption in soil. Quality was better in monoculture. Mixed cropping of spinach and radishes was unfavourable for both, possibly due to the production of saponene and mustard-oil substances in the respective plants.

[1736] 631.585 : 631.84
HORNER, G. M.; VANDECAVEYE, S. C. **Nitrogen fertilizers to increase efficiency of stubble mulch on wheatland.** *Proc. Natl. Joint Ctee. Fert. Appl.* 23, 1947 (203-207). [Agric. Expt. Sta., Pullman, Wash.]

Organic matter has been reduced during cultivation of soils of the wheat-growing area of Washington. This has resulted in deficiency of available N, especially where large amounts of crop residues were returned to the soil for erosion control. Application of N fertilizers increased yield, soil organic matter and soil structure; the average increase in yield in bu./acre was 0.25 times the amount of N applied (in lb.) minus 0.14, on areas with rainfall of over 14 inches.

[1737] 631.589 : 631.432
ADAMS, F.; EWING, P. A.; HUBERTY, M. R. **Hydrologic aspects of burning brush and woodland-grass ranges in California.** *Calif. Div. Forest., Sacramento* 1947, pp. 84.

Views of foresters, soil conservationists, engineers, geologists and agriculturists are presented. Soil and rainfall characteristics of California brush and woodland-grass areas are described. It is concluded that (1) burning cannot be condemned or supported for all conditions in the area, (2) evidence is not conclusive that burning is adverse to water conservation in northern and central California and data are inadequate to justify conclusions concerning southern California.

631.6 RECLAMATION. DRAINAGE. IRRIGATION

(*See also* Abs. Nos. 1637, 1663, 1664, 1669, 1762, 1840, 1898, 1907, 1935, 1936, 1939, 1978, 1979)

[1738] 631.612
LIMSTROM, G. A. **Extent, character and forestation possibilities of land stripped for coal in Central States.** *Cent. St. Forest Expt. St. Tech. Pap.* 109 [1949 ?], pp. 80.

[1739] 631.613
RANGHEL GALINDO, A. Las cajuelas de humificación. **[Humification trenches.]** *Agric. Trop.* 5, No. 3, 1949 (52-59). [Sp.]

The trenches are about 1.2 m. long and 0.3-0.4 m. wide and deep and are dug along the contour. A row of trenches above individual coffee, citrus, etc., plants commonly alternates with a row protecting the intervals between the plants. Directions are provided for construction and maintenance under various conditions of slope, erodibility and plantation condition.

[1740] 631.613
TROTMAN, R. C. **Design and construction of graded banks.** *J. Soil Conserv. Serv. N.S.W.* 5, 1949 (92-101).

[1741] 631.615
RUSSELL, E. J. **The world's marginal lands.** *Farming* 3, 1949 (205-211).

7700 million acres of marginal land are at present unsuitable for agriculture because of insufficient soil moisture, unsuitable temperature, too much wind, too little soil, harmful substances in the soil, or too little plant food. The use of grasses, reclamation in Britain and in hot countries and soil improvement are discussed.

[1742] 631.62
BISAL, F. **Siphon drainage in the Hyde-Park-Benson area, Cache Valley, Utah.** *Soil Sci.* 67, 1949 (395-401). [Utah St. Agric. Coll.]

Description of a proposed siphon-connected drain system for relieving hydrostatic pressure of an artesian aquifer.

[1743] 631.62 : 551.5
HÉNIN, S.; TURC, L. Relation entre les facteurs climatiques et le drainage du sol nu au cours de l'année. **[Climatic factors and the drainage of bare soil during the course of the year.]** *C.R.* 228, 1949 (1876-1878). [F.]

The expression $D = P - E$, (drainage = precipitation—evaporation) which is valid for Versailles conditions when $E = (1 + \gamma P^2)/P$, in which $\gamma = 1/(0.15\ t - 0.13)$ in which t = mean annual temperature in °C., is modified for application to periods of less than 1 year. Using the modified formulae on lysimetric data, the calculated monthly drainage amounts throughout 1935 for Versailles, Rothamsted and Groningen for most months agreed fairly satisfactorily with the observed amounts. The considerable disagreement between calculated and observed amounts for dry years in Tunis and Algiers, where occult precipitation is of some importance, is perceptibly decreased when the observed drainage during the dry season is subtracted from the observed amounts for the year.

631.8 FERTILIZERS

(*See also* Abs. No. 1830)

[1744] 631.81
OGG, W. G. **Improving soil productivity in temperate climates.** *Amer. Fert.* 110, No. 10, 1949 (7-10, 26-30). [Rothamsted]

A comprehensive survey is made of the mapping of different classes of soils, drainage and irrigation, cultivation, systems of farming, liming, manuring, fertilizers and trace elements, chiefly in Britain. A dressing of 0.25 cwt. of N gives yield increases of 20% in grain crops, and over 20% without dung and 12% with dung in root crops. 0.50 cwt. of P_2O_5 gives only a small increase in grain crops, but in swedes the increase is 20-50% without dung. Potatoes give the greatest response to K, 0.50 cwt. of K_2O giving an increase of 18% without dung and 6% with dung. Swedes and mangolds are less responsive, and sugar beet and cereals still less. Apart from P and K on cereals, greater responses can be obtained from heavier dressings.

On dunged land P fertilizers give one-half and K fertilizers one-third of the crop increase obtained on undunged land, but dung enables crops to respond profitably to much more N than the dung itself can supply. Long-term experiments indicate that a moderate dressing of fertilizers has led to an increase in yields of more than one third in a crop rotation compared with dung alone.

[1745] 631.81 : 545
HILL, W. L.; HARDESTY, J. O.; WHITTAKER, C. W. **Report on moisture in fertilizers.** *J. Assoc. Off. Agric. Chem.* 32, 1949 (228-241). [Bur. Pl. Indust., Beltsville, Md.]

The following methods are discussed: Determination of moisture in fertilizers by oven-drying, vacuum-desiccation, and air-flow methods; status of distillation method for fertilizers. It is recommended that the air-flow method and the vacuum-desiccation method with a drying period of 16-18 hours be made official for determining free water in fertilizers.

631.811 PLANT NUTRITION

[1746] 631.811 : 631.414.3.03
ELGABALY, M. M.; WIKLANDER, L. **Effect of exchange capacity of clay mineral and acidoid content of plant on uptake of sodium and calcium by excised barley and pea roots.** *Soil Sci.* 67, 1949 (419-424). [Inst. Pedology, Uppsala]

The roots of barley grown for 3 weeks in a dilute Hoagland solution were excised and were left 24 hours in suspensions of kaolin or bentonite made up to contain 0.5+4.5, 2.5+2.5 and 4.5+0.5 m.e. of Na and Ca, respectively per 100 g. Na and Ca were then determined in the ashed roots. From equal concentrations and ratios of the two ions the roots removed more Ca and Na from bentonite (high base-exchange capacity) than from kaolin (low base-exchange capacity). Relatively more Ca and less Na, as indicated by the Ca/Na ratios in the roots, were removed from kaolin than from bentonite, i.e., the clay mineral with the higher exchange capacity released monovalent ions more readily and divalent ions less readily than the mineral with low exchange capacity.

Pea roots were similarly investigated with mixtures of varying proportions of bentonite and kaolin, all containing 0.5 m.e. of Na and 4.5 m.e. of Ca. The results corresponded with those obtained with barley in that the Ca/Na ratio decreased with increasing proportion of bentonite.

Finally, barley and pea roots were compared in suspensions of bentonite containing different proportions of Na and Ca. The Ca/Na ratios of the pea roots were 8-12 times those of the barley roots. This is attributed to the higher acidoid content of the pea roots, their exchange capacity being 71 m.e./100 g. compared with 22.7 m.e. for barley roots. These findings can be explained on the basis of the Donnan theory of membrane equilibria.

[1747] 631.811.2
WILLIAMS, R. F. **The effects of phosphorus supply on the rates of intake of phosphorus and nitrogen and upon certain aspects of phosphorus metabolism in gramineous plants.** *Aust. J. Sci. Res. Ser. B.* 1, 1948 (333-361). [Irrig. Res. Sta., Griffith, N.S.W.]

It is considered that the demand for P caused by the growth and functioning of

plants is more important than the direct effect of external concentration of P in the medium on the rates of intake of this nutrient. P deficiency greatly depressed N uptake in the early stages of growth, apparently due to the differential effects of P on the growth of roots and shoots ; during a period of 11 days the whole of the P intake was retained by the roots.

[1748] 631.811.2 : 539.16
NELSON, W. L.; KRANTZ, B. A.; COLWELL, W. E. ET AL. **Application of radioactive tracer technique to studies of phosphatic fertilizer utilization by crops in field experiments.** *Proc. Natl. Joint Ctee. Fert. Appl.* 23, 1947 (41-58).

Potatoes absorb a high proportion of P from the fertilizer throughout the growing period ; maize absorbs high proportions early and only small amounts later in the growing period. The percentage of fertilizer P absorbed by potatoes, maize, cotton and tobacco increased with the rate of application and the percentage absorbed by potatoes, maize and cotton decreased as the amount of soil P increased. On soils high in P, cotton absorbed 2.5% of the applied P and potatoes 10%. Placement in contact with cotton seed increased the percentage of fertilizer P absorbed. With potatoes contact placement decreased the percentage of fertilizer P absorbed.

[1749] 631.811.2 : 539.16
DION, H. G.; SPINKS, J. W. T.; MITCHELL, J. **Experiments with radiophosphorus on the uptake of phosphorus by wheat.** *Sci. Agric.* 29, 1949 (167-172). [Univ. Sask., Saskatoon]

Summer-fallow wheat needs P fertilizer on dark brown and black soils. Radio-P studies show that wheat absorbs P from both soil and fertilizer ; in early stages mainly from the fertilizer and later mainly from the soil. With light applications, fertilized crops may deplete soil P reserves more heavily than unfertilized crops, but with liberal applications the reverse is usual. Application of P at seeding gives the best results, the critical P-nutrition period being the first few weeks of growth.

On neutral to alkaline soils $NH_4H_2PO_4$ proved superior to either $Ca(H_2PO_4)_2$ or $Ca_3(PO_4)_2$, the last being a poor P-carrier on such soils. The possibility of the N constituent of the first named acting as a stimulus to P uptake is being investigated.

[1750] 631.811.2 : 539.16
RUSSELL, R. S.; MARTIN, R. P. **Use of radioactive phosphorus in plant nutritional studies.** *Nature* 163, 1949 (71-72). [Dept. Agric., Univ. Oxford]

Radiation damage to plants in tracer experiments may be a serious hazard. Significant radiation effects have been observed when the level of P-32 was 10 µ C./l. Absence of any change in weight of aboveground parts of plants is not a proof that radiation damage has not occurred.

[1751] 631.811.2 : 539.16 : 632
DION, G.; BEDFORD, C. F.; ARNAUD, R. J. ST. **Plant injury from phosphorus—32.** *Nature* 163, 1949 (906-907). [Univ. Saskatchewan, Saskatoon]

In following the uptake of P from 7 fertilizer treatments, P fertilizer was applied to wheat to give 12, 24 and 48 lb./acre of P_2O_5 and P32 was used at 26 and 260 microcuries/g. of P. Tabulated results show the percentage of applied P taken up and the plant weight at different stages of growth. It is concluded that no real benefit resulted from the use of P32 and there were no harmful effects.

[1752] 631.811.2 : 631.414.3
MATTSON, S.; ERIKSSON, E.; VAHTRAS, K. ET AL. Membrangleichgewichte und Phosphataufnahme in Pflanzen. [**Membrane equilibria and phosphate uptake in plants.**] *Z. PflErnähr. Düng.* 45, 1949 (23-37). [G.]

Application of neutral salts as chlorides and nitrates to a loamy soil resulted in an increase of the P and phytin content of peas. Experiments with a cellophane and a root membrane were carried out, to investigate the membrane equilibrium and the effect of salts on the membrane permeability. Addition of salts was associated with a more rapid diffusion of P_2O_5 through the membrane and the uptake of phosphate ions by rye, barley and peas was a function of the salt concentration. The increased uptake of phosphate ions by addition of neutral salts was in accordance with the theory and with the effect of valency and is explained by the Donnan distribution of ions. In the electro-

negative root membrane of pectocellulose with high acidoid content and high cation-exchange capacity, the presence of salts caused a higher concentration of phosphate (and nitrate) ions.—B.F.G.

[1753] 631.811.4 : 631.416.7

VLAMIS, J. **Growth of lettuce and barley as influenced by degree of calcium saturation of soil.** *Soil Sci.* 67, 1949 (453-466). [Univ. Calif.]

A serpentine soil used in pot experiments with lettuce and barley was severely deficient in N and P and slightly deficient in K. After applying complete fertilizer, lettuce produced symptoms of rosette and barley of tip failure. Leaf symptoms were reduced and yields increased by the addition of gypsum or by leaching with $CaSO_4$ in addition to applying NPK. There was no improvement from leaching with $MgSO_4$ or K_2SO_4. Ca Amberlite added to the soil with full nutrients produced healthy plants and excellent yields. Mg and K Amberlites depressed yield and aggravated the symptoms. Sr Amberlites increased yield slightly and did not change the appearance of the plants.

Lettuce rosette was produced on productive soil by the addition of Mg and K Amberlites ; the addition of Ca and Sr Amberlites produced healthy plants. Where symptoms appeared, the amount of Ca in the soil was not changed, but the degree of Ca saturation was lower. After the addition of Mg Amberlites, lettuce and barley growth was reduced when the Ca saturation fell below 20% ; lettuce rosette did not appear when Ca saturation was above 25%. With K Amberlite, yield was reduced and rosette appeared in lettuce at 30% Ca saturation. Rosette symptoms were produced in water cultures low in Ca and more severely in solutions low in Ca and high in Mg or K. Plant-tissue analyses showed this to be a function of the low Ca status of the plants under the competitive influence of Mg or K.

[1754] 631.811.9 : 539.16

JONES, U. S.; HOOVER, C. D. **Radioactive materials fail to increase crop output.** *Amer. Fert.* 110, No. 10, 1949 (12).

Experiments involving fertilizing of maize and cotton with small amounts of radioactive materials failed to show beneficial or detrimental effects on crop growth or quality. Alphatron was used at 5, 10 and 20 lb./acre, radium was applied as radium bromide containing 30 micrograms of radium per lb. and uranium was applied as uranyl nitrate. Dolomite was used as the carrier.

[1755] 631.811.91 : 549.766.311

EHRENBERG, P.; BUCHNER, A. Zur Frage der Wirkung von Kieserit auf den Wasserhaushalt von Pflanzen. **[The effect of kieserite on the water economy of plants.]** *Z. PflErnähr. Düng.* 45, 1949 (220-225). [G.]

A preliminary report of pot experiments with grass. The kieserite had a depressive effect in the first stage of the young plants and the first cut on a loamy soil was low and on a sandy soil very low. The 2nd cut showed a better adaptation to kieserite and the 3rd showed a slight increase compared with the basal fertilizer application. The water consumption per gram of dry matter was reduced by the use of kieserite on sandy soil and even more on loamy soil.—B.F.G.

[1756] 631.812

DAVIES, G. R.; DITCHAM, J. B.; GREAVES, W. S. **Studies in the caking of fertilizers.** *Fert. Soc. Proc.* 5, 1949 (11-22).

Addition of 3% of bulky conditioners such as peat, straw or sawdust prevents serious caking under reasonable storage conditions. Finely-divided inorganic materials seem to increase caking.

[1757] 631.812

SHERWIN, K. A. **Wood meal as a conditioning agent in mixed fertilizer.** *Fert. Soc. Proc.* 5, 1949 (29-46).

Incorporation of 3% wood meal in a 7-7-10½ fertilizer at the first mixing conditioned the fertilizer in 3 weeks equivalent to conditioning without wood meal in 3 months.

[1758] 631.813

BERKNER. Der Einfluss der "Bodenstimmung" auf die Ertragsbildung. **[The influence of soil reaction on yields.]** *Z. PflErnähr. Düng.* 45, 1949 (194-219). [G.]

Long-term experiments were conducted to investigate the productivity of a sandy soil receiving physiologically acid and alkaline fertilizers. The growth of the plants (potatoes, oats/barley, millets, rape-seed)

was generally better in the alkaline series. The reaction of the soil was favourably influenced by regular applications of farmyard manure plus lime, causing in the subsequent crops an average yield increase of 25% in the acid series and of 50% and more in the alkaline series.—B.F.G.

[1759] 631.813
CROWTHER, E. M. **Condition in fertilizers.** *Fert. Soc. Proc.* 5, 1949 (3-10).

Some problems of the farmer and the agricultural chemist are outlined. Hygroscopicity, drillability, powdered and granular fertilizers are among the topics discussed.

631.816.32 FERTILIZER PLACEMENT

(*See also* Abs. Nos. 1781, 1849)

[1760] 631.816.32
COOKE, G. W. **Fertilizer placement in England.** *Amer. Fert.* 110, No. 12, 1949 (9-11, 22-30). *Fert. Feed. J.* 35, 1949 (359-365, 392-398). [Rothamsted]

Recent experimental work in England is reviewed. On cereals, yield from 1.5 cwt./acre of super. drilled with the seed was very similar to that from 3 cwt. broadcast. On chalky soils in Southern England 0.5 cwt./acre of KCl combine-drilled is as effective as 1 cwt. broadcast. On soils less deficient in K, broadcasting is as efficient as combine-drilling. Heavy dressings of K and N damage cereal germination, and combine-drilling of fertilizer with seed of sugar beet, swedes and peas has seriously reduced germination. The development of a fertilizer-placement drill for potatoes and sugar beet is described. Poor condition of powdered fertilizers for potatoes limits their value for placement and only granular fertilizers have sufficiently constant physical properties for accurate placement. For potatoes planted in ridged land, broadcasting of fertilizer over the ridges before planting is recommended. Sideband placement gives similar results and planting machines working on the flat should place the fertilizer a little below and to the side of the seed. For sugar beet, a 3-row machine has been constructed by the National Institute of Agricultural Engineering. It places the fertilizer in any desired position and sows the seed in one operation. For sugar beet and mangolds, fertilizer containing much N and K should be placed not less than 2 inches to the side of the seed. Sugar beet showed considerable benefit from placed fertilizer early in the season, but at harvest there was little difference in yields from broadcast and placed fertilizer. It is likely that fertilizer placed in bands is of maximum value on rapidly-growing crops with small root systems. Swedes gave higher yields from placed fertilizer in 1947 and placement 1-3 inches away from the seed is of particular value to peas. For cereals, the amount of super. drilled with the seed gives the same yield as twice the quantity broadcast.

Possible future trends in placement are discussed including plough-sole fertilization, application of liquid fertilizers in irrigation water, and anhydrous ammonia.

631.82 MINERAL AMENDMENTS. LIME

[1761] 631.822
FERRO, R. B.; MIDDLETON, A. C. **Clay marling: mechanized methods.** *Agriculture* 56, 1949 (123-128).

About 40,000 acres of light sand land in the Vale of York and Vale of Pickering would benefit from clay marling. Between the sands and the Wolds are deposits of clays which used to be dug out and spread on the blowing sands. Rates of application, clay-pit operations, transport and spreading of the marl are discussed. 150 tons/acre seems necessary on good carrot-growing land.

Clay marling can be performed efficiently with modern mechanical equipment and will improve the productivity of many light sandy soils.

[1762] 631.828
KNICKMANN, E. Versuche über die landwirtschaftliche und forstliche Verwertbarkeit einiger industrieller Abfallstoffe. [**Studies of the utility of some industrial waste products in agriculture and forestry.**] *Beitr. Agrarwissensch.* 2, 1948 (20-34). [G.] [Hohenrode]

The composition and effects of the wastes are recorded. The limit of incipient damage to plants is accurately given by the seedling method, but pot or field experiments using at least 2 different soils are required to estimate

the fertilizer value. Wastes having a liming effect were carbide sludge from acetylene production, which should be composted or allowed to lie over winter ; the light ash trapped in the chimneys of power stations etc., which lowered soil acidity, and filter chalk from fuel plants, the sulphide content of which was less toxic in organic than in mineral soils. Waste materials containing N included ash from smokescreen materials, ammonical liquors from coke plants and waste factory liquors containing nitrates and organic N ; all 3 require careful application at limited rates. A foundry sludge, although well provided with nutrients, contained heavy metals preventing its use as fertilizer. Basins of concentration sludge from ore washings may be rich in Ca, K and sometimes P. When the sludge is deep and dry enough, ploughing and the growth of mustard, rape, etc., will prepare the basin for later rotational use. Dumps from iron, lignite and coal mining in some cases needed liming, but always required aeration and organic matter, either from incorporation in a farm well stocked with cattle or by afforestation with humus-producing and nitrogen-collecting deciduous trees.

[1763] 631.828

LEPPER, W. Über den landwirtschaftlichen Wert des Trümmerschuttes. **[The agricultural value of ruin rubble.]** *Z.Pfl Ernähr. Düng.* 42, 1948 (224-228). [G.]

Analyses of 40 samples of ruin rubble from four German towns showed 11.31% of $CaCO_3$, 0.09% of P_2O_5 and 0.17% of K_2O.—B.F.G.

[1764] 631.828 : 546.215

MELSTED, S. W.; KURTZ, T.; BRAY, R. **Hydrogen peroxide as oxygen fertilizer.** *Agron. J.* 41, 1949 (97). [Ill. Agric. Expt. Sta., Urbana]

Experiments were carried out in 6 concrete lysimeter plots on soil of excellent tilth and containing 6% of organic matter. 2 plots were forcibly aerated with an air pump attached to the bottom drainage outlet and air forced up through the soil. 2 more were treated with 250 ml. of 30-vol. H_2O_2 diluted in 20 gallons of water each week over a 12-week period. The 2 remaining plots were check plots. All plots were irrigated uniformly and received uniform applications of fertilizer. Maize was planted in 1947 and soybeans in 1948. In both years, yields were increased with aeration and peroxide treatment, except for soybeans receiving N, where excess nitrates may have reduced the oxygen requirements. It is suggested that oxygen deficiency may occur under heavy crops on soils of excellent tilth.

[1765] 631.828 : 546.27

MIDGLEY, A. R.; DUNKLEE, D. E. **Boron for Vermont soils and crops.** *Vt. Agric. Expt. Sta. Bull.* 539, 1947 (3-20). C.A. 43 (3956).

Various methods of adding B to the soil are discussed including the suggestion that the addition of B to urine and manure applied to the soil reduces N losses through volatilization. Untreated urine lost 24.7 lb. of N per ton of urine ; lots treated with 10 lb. of boric acid lost 3.7 lb. in 45 days at room temperature. Precautions against the use of excessive amounts of B are stressed.

631.83 POTASSIUM FERTILIZERS

(*See also* Abs. No. 1848)

[1766] 631.83 : 545

LEJEUNE, G. Une méthode rapide de dosage du potassium dans les engrais. **[A rapid method for determining potassium in fertilizers.]** *C.R.* 227, 1948 (434-435). [F.]

K in fertilizers can be determined as $KClO_4$, to within 2% accuracy, in the presence of Na, Mg, NH_3, SO_4 and Cl. Experimental details are given. The solubility product of $KClO_4$ is calculated and from this the amount of K remaining in solution.

[1767] 631.83 : 545

FORD, O. W. **Report on potash.** *J. Assoc. Off. Agric. Chem.* 32, 1949 (247-253). [Purdue Univ., Lafayette, Indiana]

When like portions of the same sample of K and insoluble P fertilizers were ground in the old type Burr mill and the new Micro-sampl]mill, slightly lower insoluble-P_2O_5 and higher K_2O values were obtained in the new type of mill. The increased rate of grinding removes the danger of moisture changes during preparation.

631.84 NITROGEN FERTILIZERS

(*See also* Abs. No. 1714)

[1768] 631.84 : 545
ETHEREDGE, M. P. **Report on nitrogen in fertilizers.** *J. Assoc. Off. Agric. Chem.* 32, 1949 (241-246). [St. Coll., Mississippi]

The Devarda method and the formaldehyde titration method give about equal results on the analyses of NH_4NO_3 for total N. It is recommended that the formaldehyde titration method be adopted as official.

[1769] 631.841.1 : 631.812
ETTLE, G. W. **Some chemical aspects of ammonium sulphate production.** *Fert. Soc. Proc.* 5, 1949 (47-63).

[1770] 631.841.8
DIKE, K. **The use of anhydrous ammonia as fertilizer.** *Chron. Nat.* 104, 1948 (150-154). Hort. Abs. 19 (8).

Two methods are described : nitrogation, or the application of liquid NH_3 to irrigation water and nitrojection, or the injection of NH_3 gas directly into the soil.

[1771] 631.847.2
SCHMIDT, O. C. Über die Wirkung verschiedener Impfpräparate für Leguminosen. **[The effect of various inoculation preparations on legumes.]** *Z. PflErnähr. Düng.* 42, 1948 (268-271). [G.]

Inoculation tests with three commercial preparations, "Azotogen", "Leguminin" and "Radicin", gave some significant yield increases, but no uniform effect was obtained.
—B.F.G.

631.85 PHOSPHATE FERTILIZERS

(*See also* Abs. No. 1955)

[1772] 631.85
SAUCHELLI, V. **Evolution in fertilizer phosphate industry.** *Indust. Engng. Chem.* 41, 1949 (1314-1315). [Davison Chem. Corp., Baltimore, Md.]

[1773] 631.85 : 539.16 : 631.812
HILL, W. L.; FOX, E. J.; MULLINS, J. F. **Preparation of radioactive phosphate fertilizers. Field tests by tracer methods.** *Indust. Engng. Chem.* 41, 1949 (1328-1334). [Bur. Pl. Indust., Beltsville, Md.]

[1774] 631.85 : 545
JACOB, K. D.; WARD, F. N.; MAGNESS, R. M. ET AL. **Report on phosphoric acid in fertilizers : Comparison of neutral ammonium citrate and two per cent citric acid solutions as solvents for basic slag.** *J. Assoc. Off. Agric. Chem.* 32, 1949 (202-228). [Bur. Pl. Indust., Beltsville, Md.]

Results show significantly higher values for citrate-insoluble P_2O_5 than for citric acid-insoluble P_2O_5. Continuous agitation during citrate digestion may narrow the gap between the two.

[1775] 631.85 : 545
MARTENS, P. H. Notes résumées sur l'évolution de l'analyse des engrais. II. **[A resumé of the development of fertilizer analysis. II.** *Ann. Gembloux* 55, 1949 (57-87). [F.]

See *Soils and Fert.* XII [1338] for part I. In this final part the determination of P_2O_5 by precipitation as NH_4-Mg phosphate with transformation to pyrophosphate and as NH_4 phosphomolybdate, and the determination of K as chloroplatinate and perchlorate are discussed. 349 references.

[1776] 631.85 : 631.812
WILKERSON, T. L. **Processing phosphate rock for use in agriculture.** *Indust. Engng. Chem.* 41, 1949 (1316-1317). [Amer. Cyanamid Co., New York]

]1777] 631.853
TROCMÉ, S.; BARBIER, G. Sur la vitesse de décomposition dans le sol des scories de déphosphoration. **[On the rapidity of decomposition in the soil of basic slags.]** *Ann. Agron.* 19, 1949 (261-270). [F.] [Versailles]

A discussion on the necessity of fine grinding of slags for soils deficient in phosphates and of neutral or alkaline reaction. For 2 recently-prepared slags a satisfactory rate of decomposition (40% in 3 months in a soil of pH 8) was obtained only by grinding to 150 mesh.

[1778] 631.855 : 631.812
DEMMERLE, R. L.; SACKETT, W. J. **Continuous superphosphate production.** *Indust. Engng. Chem.* 41, 1949 (1306-1313).

[1779] 631.855 : 631.812
SHOELD, M.; WIGHT, E. H.; SAUCHELLI, V. **Rock-acid ratio in superphosphate manufacture.** *Indust. Engng. Chem.* 41, 1949 (1334-1337).

[1780] 631.855 : 631.816.3
POPOV, N. V. **[Applying granulated superphosphate in the rows at seed time.]** *Sovet. Agron.* No. 4, 1949 (59-62). [R.]

The seeds and fertilizer are usually sown at the same time with a seed drill with two compartments, one for the seed and the other for the fertilizer, which is placed slightly lower than the seeds. With granulated super. the seeds and the fertilizer can be sown together. A method of preparing granulated super. by mixing with dry sheep-droppings is described and is considered to be simple enough for use in kolkhozes.

[1781] 631.855 : 631.816.32
AVDONIN, N. S. **[The application of granular superphosphate in rows.]** *Agrobiologia* No. 2, 1949 (29-48). [R.] [Moscow]

Greatly increased yields of a number of crops were obtained by row placement of granular super., as compared with broadcasting ordinary super. With some crops the placed fertilizer was 20-30 times as effective as the broadcast. Among the crops which reacted most favourably to row placement were poppy, tomato, sugar beet, lucerne and lettuce; less favourably, wheat, rice, carrots, linseed, peas and maize; not at all, mustard, haricot beans.

[1782] 631.859.1 : 631.813
THOMPSON, H. L.; MILLER, P.; DOLE, F. H., ET AL. **Properties of diammonium phosphate fertilizer produced by saturator process.** *Indust. Engng. Chem.* 41, 1949 (485-494). [T.V.A., Wilson Dam, Ala.]

Diammonium phosphate, produced from anhydrous ammonia and electro-furnace phosphoric acid in a pilot plant using a new saturator-type process, consisted of aggregates of thin tabular crystals banded by a film of fine crystals. The product contained 0-5% of monoammonium phosphate, but otherwise was substantially free of impurities. The product was strong enough to withstand ordinary fertilizer handling without excessive degradation, was satisfactorily non-hygroscopic, satisfactorily drillable and suitably stable with respect to loss of ammonia by volatilization under normal conditions of temperature and humidity. Laboratory and field tests showed that a diammonium phosphate—KCl mixture was compatible with $(NH_4)_2SO_4$, $NaNO_3$ and normal and concentrated super. in all proportions tested; the properties of the resultant mixtures were satisfactory. Mixtures containing NH_4NO_3 caked excessively and those containing $CaCN_2$ or high proportions of NH_4NO_3 or urea suffered significant ammonia losses.

631.86/7 ORGANIC FERTILIZERS

[1783] 631.86/7 : 631.81
WADHAM, S. M. **The humus controversy.** *Annie B. Cunning Lectures on Nutrition* No. 5, 1948, pp. 20.

Most of the evidence adduced in favour of the superiority of organic over inorganic fertilizers will not bear the scrutiny of statistical analysis. Many results are quoted which are explicable in terms of the capacity of a suitable type of humus to provide small quantities of trace elements. It is pointed out that most of the so-called artificials were at one time or other derived from the upper layers of the soil, and therefore there does not appear to be any reason why their use should be reprehensible solely because the material has been reduced to concentrated form or stored for long periods before use.

More detailed knowledge is needed of the way trace elements affect animal and plant physiology and of the causes of unavailability of these elements in soils.

[1784] 631.86/7 : 631.81
AGASSIZ EXPERIMENTAL FARM. **Long-term fertility experiment.** *Dominion Expt. Farm, Agassiz, B.C. Prog. Rept. 1936-47*, 1949 (22-27).

Over 10 years, 20 tons/acre of rotted manure+250 lb. of super. gave the highest yields of mangels, followed closely by 30 tons of rotted manure + 20 tons of fresh manure in spring. 500 lb. of super. + 10 tons of manure was slightly more effective than complete fertilizer used at the same rate. 10 tons/acre of rotted manure alone is insufficient. Manured plots gave an average increase of 40% over 1000 lb./acre of chemical fertilizer without manure. The response of

maize to manure + fertilizer was equally pronounced.

Response of clover to fertilizers applied 2 years earlier was slight and much less than the response to manures applied 2 years earlier. Response of oats following manure applied to mangels the previous year was 19% greater than that following fertilizers.

[1785] 631.86/7 : 631.81
HOPKINS, D. P. **Organic v. inorganic.** *Fert. Feed. J.* 35, 1949 (159-161).

A discussion on fertilizers for horticultural crops. It is emphasised that recently non-mystic explanations of the preference for organic N have been presented: at the required rates of N dressing only the organics would avoid damage to soil texture, or, at these required rates, the soluble chemical or mineral fertilizers would produce soil solutions with excessive osmotic pressures. American growers' experience is quoted showing that good vegetable crops can be obtained from almost exclusively inorganic fertilizers provided that the fertilizer practice is soundly based upon soil testing and knowledge of crop needs. (See also *Soils and Fert.* XII [1648].)

[1786] 631.86
JEWITT, T. N.; BARLOW, H. W. B. **Animal excreta in the Sudan Gezira.** *Emp. J. Expt. Agric.* 17, 1949 (1-17). [Dept. Agric. Sudan]

From experiments with penned animals it is clear that the manurial value of excreta depends on the feeding of the animals and that the amount of N in the urine varies from 50 to 67% of that in the dung according to the diet. Field collections of dung in unirrigated areas contained 0.3-0.4 kg./acre of N; on irrigated areas the N content was 2.8 kg./acre where sheep and goats were grazed on Dolichos and standing sorghum stalks, but mcuh less where they grazed on sorghum stumps and weeds. After feeding on Dolichos hay, the N content of urine and dung was higher than after sorghum straw. In pot experiments with radish response to medium- and low-N dungs was small, but high-N dungs were about half as good as $(NH_4)_2SO_4$. Urine was as good as or better than $(NH_4)_2SO_4$ in increasing yield.

[1787] 631.86 : 636.5
RÖMER, R. R. **[Value and use of poultry manure.]** *Deut. Landw.* 2, 1948 (120-121). B.A. BIII, 1949 (145). [G.]

The annual yields and composition of manure from different kinds of poultry (hens, ducks, geese) are tabulated and compared with analyses of cow and other manures. In this respect 100 hens equal one cow. Notes on use (including composting) of poultry manure are added.

[1788] 631.86 : 636.5
TSCHERNIAK, A. Stickstoffverluste beim Trocknen von Geflügelexkrementen. **[Nitrogen losses on drying poultry manure.]** *Landw. Jahrb. Schweiz* 62, 1948 (547-554). [G.] [Fed. Tech. High School, Zürich]

Losses of N with different storage times, methods of drying and with or without the addition of H_2SO_4 at the rate of 0.04 equivalent/100 g. of manure were studied. Immediate air-drying at 65°C. or vacuum-drying at 40°C., with or without H_2SO_4, gave insignificant N losses. Storage for 24 hours before drying caused a small loss in the wet material without H_2SO_4 that was slightly increased by subsequent drying. Wet storage without H_2SO_4 for 8 days caused a 26% loss increased by drying to 34% of the original N content, while with H_2SO_4 the loss was 0.8% wet and 3% on drying. N loss decreased with increasing H_2SO_4 additions, falling to 0.01% with 0.12 equivalent of H_2SO_4 per 100 g. of manure. Manure allowed to collect for 8 days in a respiration apparatus showed N losses of 0.19% wet and 0.25% on drying. The addition of H_2SO_4 before drying did not decrease this loss.

[1789] 631.863 : 631.875
SCOTT, J. C. **Field tests with composts incorporating human faeces. Studies on the control of faecal-borne diseases in North China. No. 19.** *Emp. J. Expt. Agric.* 17, 1949 (73-81). [Cheloo Univ., Tsinan]

Preliminary work at Tsinan was done to compare the action of (a) farm compost (human faeces, straw, some horse and cow manure and soil), (b) pig-pen manure (human faeces and urine plus farm wastes, stored in pig pens), (c) faeces cake (dried human faeces), (d) $(NH_4)_2SO_4$ and (e) untreated soil. Crops used were winter wheat and late millet in continuous alternation. Conclusions were

that faeces cake and $(NH_4)_2SO_4$ were rich in readily available N, but had only slight residual effects, whereas pig-pen manure and farm compost have slower and sustained action.

In a further experiment three additional fertilizers were introduced: city compost (garbage plus human faeces), monocalcium phosphate and potassium sulphate. Crops comprised one sequence of wheat, soybeans, fallow, millet, with fertilizers used on wheat and millet only. With N at 54 lb./acre in farm compost and pig-pen manure, and K_2O at the same rate, no improvement occurred. Slight advantage was gained from P_2O_5 at 67 lb./acre, but good results were again given by faeces cake and $(NH_4)_2SO_4$ and by city compost. For soybeans, moisture proved a limiting factor, and soil reserves were depleted more rapidly by irrigated than by unirrigated crops.

A third experiment dealt with N levels and showed that heavier applications of farm compost up to eight times the original produced progressively higher yields.

Returns per unit of faeces used were highest for city compost, less for faeces cake and farm compost and lowest for pig-pen manure. Moisture-holding properties of soil seemed unaffected by any fertilizer treatments.

[1790] 631.863 : 631.879.1
WANG, Y. **A field study on the disposal of garbage and night-soil by composting.** *Sci. Tech. China* 1, 1948 (80-82). C.A. 43 (3960).

18 tons of night soil composted with an equal weight of garbage produced 20 tons of manure which contained 0.91% of N, 1.03% of P and 22.15% of volatile matter (dry basis). A temperature of over 60° was reached and this was sufficient to destroy disease germs and fly larvae.

[1791] 631.871
FRECKMANN. Über den Vorfruchtwert der wichtigsten Kulturpflanzen. **[The nutrient value of the field residues of the most important crop plants.]** *Z. PflErnähr. Düng.* 45, 1949 (263-267). [G.]

A table of the N and humus content of the stubble and root residues of several crops is presented. Special attention is drawn to the introduction of grass leys, which offer high N and humus values. Light application of well rotted farmyard manure to broken grass sod accelerates the mobilization of nutrients.—B.F.G.

[1792] 631.871 : 634.8
BLONDEL, L. Fumier artificiel et l'utilisation des marcs de raisin. **[Artificial fertilizers and the use of grape residues.]** *Bull. Serv. Agric. Gén. Algér* 148, 1948, pp. 7. Hort. Abs. 19 (9). [F.]

Instructions are given for the preparation of compost from grape pomace, which must first be neutralized.

[1793] 631.874 : 631.811.2
WHITE, J. L.; FRIED, M.; OHLROGGE, A. J. **A study of the utilization of phosphorus in green manure crops by the succeeding crop, using radioactive phosphorus.** *Agron. J.* 41, 1949 (174-175).

Methods used for measuring the efficiency of utilization of P fertilizers and for determining the contribution of P in green-manure crops to P fertility are described. On a silt loam very low in available P, lucerne was as effective a source of P as was KH_2PO_4. The possibility that this is true of all green manures is of immense practical significance, especially as only 5 weeks elapsed between incorporation of the green manure and the crop harvest.

[1794] 631.874 : 635.658
FOTIDAR, M. R. **Lentil as green manure.** *Indian Farm.* 10, 1949 (111-112).

Lentil (*Lens esculenta*) can be grown economically in the Kashmir Valley where vegetative growth ceases for 5 months during the winter. Lentil can survive through snow and makes quick growth in early spring before the land is puddled for rice. In the first year of an experiment green manuring with lentils at a rate equivalent to 68 lb./acre of N gave the same increase in yield as application of $(NH_4)_2SO_4$ at the same rate of N application. The residual effect of lentils was greater than that of $(NH_4)_2SO_4$. Lentil should be sown 2-3 weeks after harvesting paddy. When it begins to flower it is levelled and buried with a furrow-turning plough. The field is ready for puddling within 2 weeks.

[1795] 631.875 : 631.461.74
FORSYTH, W. G. C.; WEBLEY, D. M. **The microbiology of composting. II. A study of the aerobic thermophilic bacterial flora developing in grass composts.** *Proc. Soc. Appl. Bact.* 1948 (34-39). [Macaulay Inst., Aberdeen]

The most rapid development of a thermophilic flora was in the upper layer of composts made from grass clippings. The thermophiles included rod-shaped spore-forming bacilli and an actinomycete of the *Micromonospora* type. The latter was only isolated with great difficulty. Many of the organisms possessed strong ammonifying powers, particularly the facultative thermophiles which were also strongly proteolytic.

[1796] 631.875 : 631.812
LEPELTIER-BEAUFONDS, A. La zymothermie, ou fabrication de l'humus. **[Zymothermy, or the preparation of humus.]** *Rev. Agric. Réunion* 48, 1948 (227-232). Hort. Abs. 19 (8).

Zymothermy is described as an aerobic fermentation of plant and animal refuse in closed containers of 50,000-l. capacity. There is no supply of external heat, spontaneous combustion producing a temperature of 50-85°C. Substances suitable for treatment are described and the chemical composition of the final product, Zymos, is given.

[1797] 631.875 : 631.812
DEMORTIER, G.; BOULLE, M. E. La fabrication du fumier artificiel. **[The preparation of artificial manure.]** *Rev. Agric. Bruxelles* 2, 1949 (359-361). [F.]

Heaps 2 m. high of successive 30-40-cm. layers of soaked straw (1) sprinkled with urine, (2) covered with decomposing farmyard manure, (3) chalked at 10 kg./ton with each layer except the top sprinkled with NH_4 salts or (4) treated with $CaCN_2$ at 25-50 kg./ton, produced in 120-150 days a manure ready for burying. 90-100 days were required with a commercial bacterial-solution method in which well-soaked straw was heaped to 1 m.80 cm. and gently trodden ; $\frac{1}{3}$ was spread into a 50-60 cm. layer on reaching 15-20°C. and soaked with the solution, a further 2 layers being successively added and treated. External temperature affects the time required in all these methods, and in cold weather the heap should be protected by screens of pressed straw or by being constructed behind a sheltering wall.

[1798] 631.876.9 : 634.985
WOLF, B. **The possible use of bark in soils.** *N-E. Wood Util. Counc. Bull.* 25, 1949 (109-117). [Seabrook Farms]

The drawbacks to the use of bark as a soil amendment are its wide C : N ratio and its bulk. The first might be overcome by increasing the N content of bark, and farmers could afford to pay more for N-enriched materials. It is possible that wood materials may be enriched with N either by inoculation with a suitable organism or by applying N solutions direct to the material. P and K might also be added. Other uses for bark in the soils may be for erosion control or as a mulch.

[1799] 631.878
SWINNERTON, A. A.; RIPLEY, P. O. **The agricultural use of peat materials.** *Canada Dept. Agric. Pub.* 803, 1947, pp.15. Bull. Imp. Inst. 46 (265).

[1800] 631.879.1
MITSCHERLICH, E. A.; ATANASIU, N. Zur Bewertung des Müslls. **[The evaluation of town refuse.]** *Z. PflErnähr. Düng.* 45, 1949 (226-231). [G.]

The results of pot- and field experiments showed a very low content of N, P and K in fresh and 20-year-old refuse. A mixture with sand showed a yield increase in pot experiments but not in the field. Because of their low effect in the field, these substances have to be regarded only as a soil ameliorant of which heavy applications are necessary in conjunction with fertilizers.—B.F.G.

[1801] 631.879.1
ROWAAN, P. A. Stadsvuilcompost als meststof. **[Town refuse compost as fertilizer.]** *Maandbl. LandbVoorlD.* 6, 1949 (190-194). [Du.]

Pot experiments at Groningen, using oats as test plant, are described. The material, applied at 50 tons/ha., supplies 200 kg. of N, 200 kg. of P_2O_5, 100 kg. of K_2O, 1600 kg. of $CaCO_3$, 150 kg. of MgO and 20 kg. of Cu. The results indicate that the N effect is about 10% of that of inorganic N fertilizer and that the residual effect is nil. The P effect is 10 to 15% of that of inorganic P and there is a similar residual effect in the second year. The K effect is similar to that of inorganic K ; the compost should be applied with

caution in the first year because of the danger of lowering the starch value of potatoes by too high K manuring. The high lime content raises soil pH significantly (but to a less extent than does very finely ground manufactured lime) and improves yields. The Mg content should be valuable on Mg-deficient soils and the Cu content on land affected by reclamation disease, but this remains to be proved.—K.S.

[1802] 631.879.2 : 616
GEAR, J.; MEASROCK, V. **Poliomyelitis and sewage.** *J. Inst. Sewage Purif.* 1949 (82-84). [S. Afric. Inst. Medic. Res.]

Raw sludge may contain the virus and is a potential source of infection. Adequately digested sludge is free from the virus and is safe for use as a fertilizer. Settled sewage and the effluents from air-filter beds and humus tanks are dangerous potential sources of infection. The virus has not been detected in the final effluent after sand filtration. Compost from an inadequately supervised composting plant may contain virus. The effluent from an ordinary septic tank may be a potential source of infection.

[1803] 631.879.2 : 631.875
KRIDGE, P. R. **Some thoughts on the agricultural importance of sewage sludge.** *J. Inst. Sewage Purif.* 1949 (84-90).

Dry digested sludge is dead material and is not immediately available plant food. It responds readily to composting.

631.893 MIXED AND COMPOUND FERTILIZERS

[1804] 631.893.12
KOELLIKER, E.; RUOSCH, —. Herstellung und Anwendung von Nitrophosphat. [**Production and application of nitrophosphate.**] *Z. PflErnähr. Düng.* 45, 1949 (72-75). [G.]

This "Lonza" product is prepared from raw phosphate and nitric acid. By use of a new procedure, a fertilizer with good spreading and storing quality is obtained. The composition is: 18.1% of P_2O_5 (total), 15.3% of water-soluble P_2O_5, 7.9% of N, and 25.2% of CaO. The "Complex" fertilizer contains additionally 6.9% of K_2O. These quick-acting fertilizers, applied to cereals, roots, vegetables, tobacco, etc. just before or during growth, have given good returns.—B.F.G.

632 PLANT DISEASES. WEEDS AND PESTS

(*See also* Abs. No. 1835)

[1805] 632.191 : 631.811.9
HUDIG, J. **Minor elements in Dutch crop husbandry.** *Farming* 3, 1949 (172-174).

Diseases caused by lack of Cu, B, Na, Mn and Mg and K : Mg ratios are discussed.

[1806] 632.2
THOMPSON, H. W. **The potato-root eelworm (*Heterodera rostochiensis* Woll.) in the United Kingdom.** *Emp. J. Expt. Agric.* 17, 1949 (60-71). [N.A.A.S.]

Affected areas, symptoms of attack on potatoes and tomatoes, spread of infestation, influence of soil type, control methods, manurial treatments and rotations are discussed. The effects of eelworm attack are likely to be most severe on light soils and cyst numbers are likely to be greater and infestation to remain longer than on heavier soils. Steam sterilization of greenhouse tomato soils or replacement of soil to a depth of 15 inches ensures two tomato crops without undue infestation. The only practical means of maintaining satisfactory potato crops is to use rotational cropping that will not increase infestation. Sugar beet is useful in the rotation, but grass leys with stock are recommended.

[1807] 632.2 : 631.421
THORNE, G. **Nematodes as a disturbance in greenhouse, plot and field experiments.** *Plant Dis. Reptr.* 32, 1948 (473-475). Hort. Abs. 19 (31).

The hazards of selecting experimental sites and soils without previous check on the presence of plant pathogenic nematodes are pointed out.

[1808] 632.2 : 632.181
THOMPSON, H. W.; ROEBUCK, A.; COOPER, B. A. **Floods and the spread of potato root eelworm.** *Agriculture* 56, 1949 (109-114).

As a result of floods early in 1947 there was no widespread heavy infection with potato-eelworm cysts of land previously free from the pest. Appreciable new infestation has been confined to flood margins. The same applies to other cyst-producing eelworms which attack beet, peas, brassicas and cereals.

[1809] 632.2 : 632.953
ELLIS, D. E. **Soil treatments with new insecticides ineffective in control of root-knot.** *Plant Dis. Reptr.* 32, 1948 (476-477). Hort. Abs. 19 (31).

Benzene hexachloride, DDT Parathion, Chlordane and chlorinated camphene failed to reduce appreciably the incidence of root-knot nematode in okra and snap bean.

[1810] 632.2 : 632.953
NEWHALL, A. G.; LEAR, B. **Soil fumigation for nematode and disease control.** *Cornell Agric. Expt. Sta. Bull.* 850, 1948, pp.32. Helminth. Abs. 17 (166).

Methods are given for the fumigation of potting soil, greenhouse beds and benches, and fields. Results of field tests with D-D mixture and a 10% ethylene-dibromide fumigant are given. Economic aspects of fumigation are discussed and quantities of the different fumigants required can be calculated from tables given.

[1811] 632.2 : 632.953
MACHMER, J. H. **Soil fumigation for the control of root-knot nematode in peach, fig and grape plantings.** Abs. in *Phytopath.* 39, 1949 (498).

After fumigating soil 6 in. and 18 in. deep with chloropicrin, the diameter of tree trunks increased 1.05 in. with root-knot-resistant cover crops and 0.72 in. with susceptible cover crops. In non-fumigated soil, increases were 0.60 and 0.47 in. respectively. After 5 seasons, average trunks on fumigated sites with resistant cover crops were 3.88 in. and on untreated sites with susceptible cover 2.59 in. Yield was 46.4 lb. on fumigated, resistant sites and 23.9 lb. on sites with susceptible cover. On untreated sites yields were 18.2 and 9.7 lb. with respective covers. Fumigated subsoil produced greater tree vigour than did fumigated larger shallow areas.

[1812] 632.732
COATON, W. G. H. **The harvester-termite problem in South Africa.** *S. Afric. Dept. Agric. Bull.* 292, 1947, pp. 38. [Div. Entom., Pretoria]

Distribution and control measures are discussed. In cultivated land bait should be applied just before or during sowing or shortly after the grain has sprouted.

[1813] 632.732
COATON, W. G. H. **Trinervitermes species—the snouted harvester termites.** *S. Africa Dept. Agric. Bull.* 261, 1948, pp. 19. [Div. Entom., Pretoria]

Eradication and mound demolition as an integral part of veld reclamation are discussed.

[1814] 632.732
TOCKLAI EXPERIMENTAL STATION. **Control of mound-building termites.** *Tocklai Expt. Sta. Serial* 52, 1949, pp. 3.

The mound is cut across at ground level and DDT or gammexane blown or sprayed 1-2 feet deep inside the mound and in all directions. Both materials in kerosene give early effective results, but DDT wettable powders (2½-5 gallons/mound of 1% mixture of Geigy's Guesarol 550 with water) and emulsions appeared more suitable, as large quantities of fluid could be introduced cheaply. Reclamation of the mound for tea planting, if removal and replacement by fresh soil are impossible, is done by levelling the top and scattering over a wide area, applying S at ½-1 lb./10 square feet of site, depending on pH of the nest site and applying ½ maund of well-rotted cattle manure to each 10 square feet of site. A sprinkling of top soil should be given and the area green-cropped for 1 year with Giant Hemp or *Boga medeloa* sown broadcast before tea planting.

[1815] 632.765 : 631.51
SALT, G.; HOLLICK, F. S. J. **Studies of wireworm population. III. Some effects of cultivation.** *Ann. Appl. Biol.* 36, 1949 (169-186). [Zool. Lab., Univ. Cambridge]

Observations during and immediately following spring ploughing at and near Cambridge showed that 15-22% of wireworms were destroyed by cultivation, besides those eaten by birds as a result of exposure by cultivation. Evidence of the effects of change in physical conditions of soil was not complete, but there was strong evidence that the decline in wireworm population after ploughing was largely due to great reduction in the numbers and proportion of young larvae on which replenishment depends.

Stapley *et al* concluded from similar experiments after later ploughing, that no

great reduction of wireworm ensued, but it is likely that the later time of ploughing and the omission of grass controls may account for the inconsistency of their results with those above.

[1816] 632.765 : 632.951
RAWLINS, W. A.; STAPLES, R.; DAVIS, A. C. **Wireworm control with several insecticides introduced into the soil.** *J. Econ. Ent.* 42, 1949 (326-329). [Cornell Univ., Ithaca, N.Y.]

Crude and refined benzene hexachloride, chlordan, toxaphene, heptachlor and compound 118 were tested against wheat wireworm, *Agriotes mancus* (Say), and eastern field wireworm, *Limonious agonus* (Say), during a 2-year period. Applications of 0.50 and 1 lb./acre of crude benzene hexachloride gave good control. 1 lb. of refined hexachloride was not satisfactory, but 2 lb. gave good results. 4-8 lb. of chlordan gave good control. Toxaphene did not reduce injury appreciably. 2-4 lb. of heptachlor gave economic control at high levels of infestation. Preliminary results with compound 118 show considerable promise. Variation in soil type had no effect on the toxicity of the insecticides to wireworms.

632.95 INSECTICIDES. FUNGICIDES. HERBICIDES

(*See also* Abs. Nos. 1710, 1810, 1858, 1859, 1900)

[1817] 632.954
CRAFTS, A. S.; EMANUELLI, A. Erradicación de yerbajos. **[The eradication of weeds.]** *P.R. Esta. Expt. Agric. Bol.* 82, 1948, pp. 30. [Sp.]

A summary discussion of the chemical methods and materials used and of temporary and long-term soil sterilization.

[1818] 632.954
OSVALD, H.; ÅBERG, E. Kampen mot ogräset. **[Weed control.]** *Växtodling* 4, 1949 (100-123). [Sw.e.]

Present knowledge of chemical weed control is reviewed. A table shows the effect of different substances, or groups of substances, on cultivated plants and weeds.

[1819] 632.954
THOMAS, K. M.; SRINIVASAN, A. R. **Weed-killers.** *Indian Farm.* 10, 1949 (101-106). [Mycology Sch., Coimbatore]

Selective and non-selective weed-killers are discussed and Indian weeds are classified on the basis of their sensitivity to hormone weed-killers. Potato plants 6 weeks old were resistant to 0.2% MCPA. All other non-cereal crops tested including 5 oil-seed plants, 6 pulses, 7 vegetables, cotton and tobacco were extremely sensitive to 0.2% MCPA. Groundnut seedlings were affected, but the plants recovered, although their growth was far slower than untreated plants.

[1820] 632.954
TILEMANS, E. Les herbicides sélectifs. **[Selective herbicides.]** *Rev. Agric. Bruxelles* 2, 1949 (219-226). [F.]

An account of the herbicides used in Belgium. The best results for cereals were obtained with herbicides with a M.C.P.A. base used in the liquid form.

[1821] 632.954 : 577.17
DEROSE, H. R.; NEWMAN, A. S. **The comparison of the persistence of certain plant growth-regulators when applied to soil.** *Proc. Soil Sci. Soc. Amer. 1947*, 12, 1948 (222-226). [Chem. Corps, Camp Detrick, Frederick, Md.]

Considerable differences in persistence were found even in structurally related herbicides, e.g., 2,4,5-T under all conditions tested was much more persistent than 2,4-D. Persistence was increased by aridity and by low temperature, as would be expected if disappearance were due to activities of micro-organisms. Application rate appeared to be unrelated to persistence in the field: after 93 days 2,4-D and 2-methyl-4 chlorophenoxy-acetic acid had disappeared whereas 2,4,5-T had persisted. Rise of soil-moisture level induced faster disappearance of all compounds tested.

[1822] 632.954 : 577.17
HITCHCOCK, A. E.; ZIMMERMAN, P. W. **Activation of 2,4-D by various adjuvants.** *Boyce Thompson Inst. Contr.* 15, 1948 (173-193).

Mixtures of 2,4-D with certain adjuvants (Benoclor 3C, ammonium thiocyanate, ammonium sulphamate, Hammond's Weed

Killer, diallyl maleate, $NaHCO_3$ and NaCl) were more effective herbicides than were any of the individual components used in the same concentration as in the mixture.

[1823] 632.954 : 577.17
HAGSAND, E.; VÄÄRTNÖU, H. Hormonderivat i kampen mot ogräs. VI. Verkan på kulturväxter i försöken 1948. **[Hormone derivatives against weeds. VI. Effect on cultivated plants in experiments in 1948.]** *Växtodling* 4, 1949 (8-30). [Sw.e.]

The esters of 2,4-D are more effective against weeds than are methoxone or other derivatives, but they are more dangerous for cultivated plants. Copper substances are now little used, dinitro-ortho-cresols are useful for some crops like flax, and Ca cyanamide is still used against several weeds. The type and amount of damage caused to crops depends on the stage of development of the plant at the time of spraying. In cereals abnormal heads are formed if spraying is done during the period from emergence of the crop up to 3 weeks after emergence. Spraying at a later date usually causes decrease in yield, but after methoxone there may be an increase in yield. Oats are more sensitive to heavy applications than are other cereals. Methoxone is the best substance for use on peas which are very sensitive to hormone sprays. On linseed, spraying should not be done later than 2 weeks after emergence and methoxone is the best spray to use.

Hormone derivatives mixed into the soil are most effective on sandy and light clay soils, less effective on heavy clay soils and least effective on peat soils. As plants grow bigger most of the spray is taken up through the leaves and differences in soil type have not the same effect.

[1824] 632.954 : 577.17
ORCHARD, H. E. **Fighting weeds with hormone-like weedkillers.** *J. Dept. Agric. S. Aust.* 52, 1949 (459-469).

Methods and time of application of 2,4-D and MCPA, wetting agents and susceptibility of field crops are discussed. Susceptible and resistant weeds are listed.

[1825] 632.954 : 577.17
ROLAND, M. Isopropylfenylkarbamat mot flyghavre och kvickrot. **[Isopropylphenyl carbamate as phyticide of wild oats and quack grass.]** *Växtodling* 4, 1949 (49-58). [Sw.e.]

When isopropylphenyl carbamate (IPC) was mixed into the soil immediately before seeding, wild oats and quack-grass seedlings were very sensitive. Cereals and flax were very sensitive, peas, red clover, sugar beet and swedes were tolerant. In pot experiments quack grass at a later stage was killed with 20-30 kg./ha. of IPC sprayed on the soil surface. Severe damage occurred with even 6 kg./ha. Wild oats was killed with 5 kg./ha. Rape and beets were not damaged by as much as 15 kg./ha. In field experiments 10 kg./ha. killed all wild oats in a pea crop and the peas were not damaged. Using 60 l./ha. of IPC in liquid form containing 10% active substance, 60-95% of the wild oats was killed and the yield of peas increased 10-35%. Yield of green fodder was increased 300%. Germination of peas was not affected. The toxic effect disappeared during the summer.

[1826] 632.954 : 577.17 : 631.461
NEWMAN, A. S. **The effect of certain plant growth-regulators on soil micro-organisms and microbial processes.** *Proc. Soil Sci. Soc. Amer. 1947*, 12, 1948 (217-221). [Camp Detrick, Md.]

The effects of 2,4-dichlorphenoxyacetic acid, 2,4,5-trichlorphenoxyacetic acid, 2-methyl-4-chlorphenoxyacetic acid and isopropyl N-phenyl carbamate on the growth of soil micro-organisms were tested in artificial media, and their influence on nitrification and on CO_2 evolution was studied in incubated soils.

The soil was a silt loam of pH 6.7 with base-exchange capacity of 7.0 m.e./100 g. For the nitrification and CO_2-evolution studies 100 g. of air-dry soil ground to 5-mesh was placed in quart milk bottles. The plant-growth regulators were added to the soil at rates of 2.5, 12.5 and 50 mg. per 100 g. of soil in volumes necessary to bring the moisture content up to 60% of the water-holding capacity. In the nitrification studies 30 mg. of ammonium sulphate were included in the solution added. The bottles were

tightly stoppered and incubated at 28°C. For the CO_2-evolution studies the soils were incubated for 1 week and the total CO_2 evolved was determined. In the nitrification studies the soils were incubated for 1 month.

The effect of plant-growth regulators on the numbers of bacteria and actinomycetes developing on plates inoculated with 1 ml. of a 1 : 100,000 soil suspension was studied, using Thornton's medium incubated at 28°C. for 7 days. The pH of the medium was adjusted prior to sterilization, the plant-growth regulator was added, and the pH checked after sterilization. The plant-growth regulators were added to the medium to give concentrations of 25, 125 and 500 p.p.m. Eight replicates were used per treatment.

The effect of plant growth-regulators on the diameter of growth of fungi was studied, using glucose-peptone medium. A loopful of a suspension of a 3-day-old culture of fungus was placed in the centre of each plate after the medium had solidified. The plates were incubated at 28°C. and the diameter of growth was measured after 3 and 5 days' incubation. Three replicates were used per treatment.

The action of these compounds is to some extent selective; nitrification was inhibited at lower concentrations than was CO_2 evolution. On the whole an increase in acidity increased the toxicity of the substance, but isopropyl N-phenyl carbamate, ethyl 2,4-dichlorophenoxyacetate and ethyl 2-methyl-4-chlorophenoxylate were equally toxic at all pH values. The amount of the growth regulator reaching the soil at even the lowest rate of application used in these experiments was, however, more than 10 times greater than would be the case in practice, when sprays are used to control weeds, so that it is unlikely that the bulk of soil organisms would be adversely affected in normal field conditions.—L.M.C.

[1827] 632.954 : 635.13

BLACKMAN, G. E.; IVENS, G. W. **Selective weed control in carrots and related crops.** *Agriculture* 56, 1949 (58-61). [Dept. Agric., Univ. Oxford]

Mineral oils are compared for their effectiveness in weed control and time and rate of application are discussed. Susceptible annual weeds are listed.

633.1 CEREALS

(*See also* Abs. Nos. 1689, 1794, 1914, 1921, 1931)

[1828] 633.1-2.191 : 546.711

COÏC, Y.; COPPENET. La carence en manganèse dans les terres humifères de Bretagne. **[Manganese deficiency in the humiferous soils of Brittany.]** *C.R. Acad. Agric.* 35, 1949 (323-328). [F.]

Mn-deficient plants on heavily-limed humiferous soils occur in patches of soil of pH above about 6.5, in wheat during and after the second week in February and in oats from early April. The symptoms include general leaf chlorosis, grey spots towards the centre of the leaf length and sometimes parallel to the veins and a depressed habit as opposed to the upright one associated with N deficiency. The symptoms often first appear several years after liming. It is concluded provisionally that 1 mg. of exchangeable Mn/kg. of soil represents roughly the threshold value below which deficiency occurs, but this figure may need revision after studies of the effect of rainfall, etc. Spraying with 0.25% $MnSO_4$ solution at 25-50 kg./ha. of $MgSO_4.HO_2$ eliminates the symptoms.

[1829] 633.11-1.582

LANDERS, L. R. **Fifteen rotations compared.** *Wyo. Agric. Expt. Sta. Rept. 1947-48*, 1948 (45-49).

Average crop yields for 15 rotations involving spring and winter wheat, in some rotations for 20 years, are tabulated.

[1830] 633.11-1.67-1.81

DAVEL, H. B. **Research in agriculture.** *Farm. S. Africa* 24, 1949 (98-99). [Agric. Res. Inst., Pretoria]

In irrigation experiments with wheat grown in rotation with cowpeas, super. and kraal manure increased wheat yields. $(NH_4)_2SO_4$ used with limited irrigation depressed wheat yields by 4½ bags/morgen and increased soil acidity. When the irrigation was increased, $(NH_4)_2SO_4$ increased the yield by 3½ bags and the soil did not become acid. KCl depressed the wheat yield when the soil moisture was low, but not when irrigation was adequate.

Results obtained with irrigated crops differ from those usually obtained with

dryland crops on the same soil, and suggest that large amounts of fertilizers are necessary, accompanied by adequate amounts of irrigation water. Without using fertilizer, high wheat yields were obtained with moderate applications of water.

[1831] 633.11-1.81
SMITH, F. W. **Wheat fertilizer studies in Kansas.** *Proc. Natl. Joint. Ctee. Fert. Appl.* 23, 1947 (198-201). [Kansas St. Coll., Manhattan]

25 lb./acre each of N as NH_4NO_3 and P as super. increased yield of wheat significantly when either fertilizer was placed with the seed or when super. was placed with the seed and NH_4NO_3 was top-dressed. Placement of either fertilizer at the rate of 25 lb./acre on the ploughsole did not increase yield significantly, but doubling the rate of application did. Addition of K to N and P did not increase the yield further. Application of 50 lb. of NH_4NO_3 gave smaller yield than did 25 lb. Large applications of N reduced the test weight of wheat, but the protein content was not affected by fertilizer.

[1832] 633.11-1.84 : 581.192
COÏC, Y. Action des engrais azotés répandus à la floraison sur l'activité assimilatrice des organes chlorophylliens du blé d'hiver. **[The effect of nitrogen fertilizer applied at flowering on the photosynthetic activity of winter wheat.]** *C.R. Acad. Agric.* 35, 1949 (175-177). [F.]

Two effects of rapidly available N are distinguished: (1) on growth, resulting in an increase in quantity of assimilatory materials and (2) an increase in the activity of these materials. It is suggested that N applied at flowering acts mainly as in (2), causing a definite increase in grain yield over crops not receiving N at this time.

[1833] 633.11-2.954
NOULARD, L. Observations sur l'influence des herbicides sélectifs et à base de colorants sur les cultures de froment. **[Observations of the effect of selective and colour-based herbicides on wheat.]** *Rev. Agric. Bruxelles* 2, 1949 (247-252). [F.]

[1834] 633.13-2.954
LACROIX, L. Influence de certains produits désherbants sur la végétation de l'avoine et du lin. **[Influence of certain herbicides on oats and flax.]** *Rev. Agric. Bruxelles* 2, 1949 (228-242). [F.] [Gembloux]

[1835] 633.14-2.2-2.953
BRANDE, J. VAN DEN; DAMME, J. VAN Bestrijding van het Roggeaaltje. (*Ditylenchus dipsaci* Kühn.) [**Control of the rye-stem eelworm *Ditylenchus dipsaci* Kühn.**] *Meded. LandbHoogesch. Opzoekingssta. Gent* 14, 1949 (135-144). [Fl.e.]

DD mixture was applied at rates of 2, 3, 4 and 6 l./are at depths of 12 and 20 cm. The yield on the control strip was 911 kg./ha. 2 l./are gave yields of 2,640 kg. when applied at 12 cm. depth and 2,800 kg. at 20 cm. depth; 6 l./are gave yields of 3,651 and 4,022 kg. respectively. Only the 2 l. rate is economic and a depth of 20 cm. is recommended.

[1836] 633.15-1.85
AMERICAN FERTILIZER. **Corn responds to high phosphate fertilizer.** *Amer. Fert.* 110, No. 9, 1949 (22).

Experiments started in 1937 with super. (0-20-0), triple super. (0-43-0) and calcium metaphosphate (0-62-0) have been run through 4 complete rotations of maize-oats-hay. Yield of maize receiving no treatment was 86.7 bu./acre, that treated with 0-20-0 yielded 89.5 bu. and the highest yield recorded was 90.3 bu. on fields treated with 0-62-0.

[1837] 633.16-2.954
MOES, A. L'action de quelques traitements désherbants appliqués aux orges. **[The effect of certain herbicides applied to barley.]** *Rev. Agric. Bruxelles* 2, 1949 (243-246). [F.]

[1838] 633.17-1.5
JAMKHINDIKAR, M. M. **Practical results of some of the cultural operations in *Sorghum*.** *Indian Farm.* 10, 1949 (107-110).

Sorghum requires less water than maize and grows in areas where the annual rainfall is less than 40 inches. It has a temporary depressing effect on the succeeding crop, especially on cereals. It does not grow well on sandy soils, but does well on heavier soils, particularly the black cotton soils.

Preparatory tillage, ridge cultivation, bunding, mulching, interculture, rotation experiments and fallowing experiments are discussed.

[1839] 633.18-1.453 : 546.19
BURNETT, F. **The effect of arsenic on padi.** *Rept. Agric. Malaya 1947*, 1949 (32-33).

The possible toxic effect on padi of As in mining slimes was tested in pot experiments using concentrations of arsenious oxide ranging from 1 to 200 p.p.m. As had no effect on germination and growth during the first month. After 2 months' growth was retarded on plots receiving 20 p.p.m. and above this concentration the crop died. At concentrations of 1-5 p.p.m. As had a stimulating effect.

[1840] 633.18-1.671-1.81
DIJK, J. W. VAN Enige gegevens over bevloeiingswater, in het bijzonder met betrekking tot het kalivraagstuk in de bevloeide rijstbouw. **[Some data on irrigation water, with special reference to the potash problem in irrigated rice culture.]** *Landbouw* 20, 1948 (237-248). [Du.] [Alg. Proefst. Landb., Buitenzorg]

Field experiments have shown that in soils deficient in organic matter, e.g., young volcanic-ash soils, "gesik" soils, marls and "bleekaarden", rice yields are increased by the use of $(NH_4)_2SO_4$. In soils with a high organic-matter content the N supplied by rain water, irrigation water and biological sources is sufficient and N fertilizers produce no response. Irrigation water at Buitenzorg contains 0.6-1.0 mg. of ammoniacal N per litre which is equivalent to 10-18 kg./ha. during five months' continuous irrigation. Of 95 rivers of Java and Madura 77% contained less than 0.2 mg. of P_2O_5 per litre, 16% contained 0.2-0.69 mg./l., and 7% 0.7-1.8 mg./l. The mean value, 0.2 mg/l., is equivalent to 3.7 kg./ha. during the west monsoon irrigation. The amount of P_2O_5 contained in the silt is of the same order. Irrigation water does not supply nearly enough P to the sawahs and a response to P fertilizers is given. Mineral reserves and irrigation water appear to supply sufficient K, for nowhere, apart from local successes on old laterite soils, has K-manuring increased yields. The mean K_2O content of irrigation water in Java and Madura is 4.64 mg./l. which is equivalent to 85 kg./ha. per flooding period. The K_2O content of the silt is much less.

[1841] 633.18-1.816.32
WALKER, R. K.; STURGIS, M. B. **Complete fertilizers for rice.** *Better Crops* 33, 1949 (40). [La. Agric. Expt. Sta., Baton Rouge]

Weed infestation and difficulty of weed control have limited the use of fertilizers on rice. Two methods of application are successful. 300 lb./acre of 0-16-0, 3-9-6 or 3-12-12 may be applied with or under the seed at planting followed by top dressings of 24-32 lb./acre of N before the booting stage. Drilling of 400 lb./acre of 6-6-6, 9-6-9, 6-9-9, 3-9-6 or 6-9-0 fertilizer 2 inches below the seed at planting is more successful and increased yield 8.5 bu./acre over the method of drilling the fertilizer directly with the seed. There were no significant increases from minor-element applications.

633.2/3 GRASSES. LEGUMES

(*See also* Abs. Nos. 1678, 1979)

[1842] 633.283-1.416.13
GRIFFITH, G. AP **A note on the nitrate content of soil under *Pennisetum purpureum*.** *E. Afric. Agric. J.* 14, 1949 (187-188). [Dept. Agric., Uganda]

Land newly opened from *Pennisetum purpureum* (elephant grass) must be left for several weeks before successful planting of a crop can be done. Nitrate content under standing elephant grass was 10 p.p.m. while in a neighbouring strip which had carried cotton and was now bare fallow the nitrate content was 100 p.p.m. The grass was cut in April, ploughed, hand cultivated, weeded and planted with cotton on June 10. Nitrate content remained steady until a week after planting when it began to increase to a peak of 50 p.p.m. on Sept. 5 when the flowering cotton gave a complete ground cover, after which it fell to 10 p.p.m. On bare fallow nitrate accumulation began with the onset of the rains in February and reached 400 p.p.m.; there was a time lag of over 8 weeks compared with newly-opened land.

[1843] 633.34-1.5
GAGNONI, D. **Cultivation of soya in Italy.** *Olearia* 1, 1947 (36-39). Biol. Abs. 23 (209).

633.491/2 POTATOES. SWEET POTATOES

(*See also* Abs. Nos. 1806, 1910, 1962)

[1844] 633.491-1.43-1.84

FERRARI, TH. J. Stikstofbemesting en bodemfactoren. Voorlopige mededeling. **[Nitrogen manuring and soil factors. Preliminary report.]** *Landbouwk. Tijdschr.* 61, 1949 (111-120). [Du.e.] [Landbouwproefsta. Bodemk. Inst., T.N.O. Groningen]

The results of field experiments with potatoes treated at different levels of N on calcareous marine clay soil are discussed. Eight fields were on broken-up grasslands and 23 on old arable land. Yields of the no-N plots ranged from 9455 to 34,520 lb./acre. Maximum yields of the broken-up pasture were hardly ever equalled by those of old arable land; the average difference was 17%. The increase in yield obtained from soil of good structure over that from soil of poor structure was greater in the case of manured than unmanured plots. An effect of organic matter on soil structure could not be established. Yields were affected by the depth of the ground-water level of the unmanured, but not of the manured plots. Maximum yields on unmanured plots were obtained with a ground-water depth of 130 cm.

[1845] 633.491-1.5

JEDWAB, D. **Shallow potato cultivation. Mechanization with steerage toolbar.** *Farm Mech.* 3, 1949 (131-133).

To increase the intensity of potato production multi-row cultivation and shallow planting must be adopted, so eliminating hand hoeing. Hoeing is necessary only to uproot weeds and loosen the soil surface, and tines nearest the tubers may be arranged at an angle. Using the Universal steerage toolbar the sequence following planting is: covering, ridging, harrowing, hoeing, ridging. The man power required for a 3-row steerage toolbar is very similar to that for conventional tractors; the 4-row toolbar requires less man power. Potatoes can be cultivated with a horse-drawn toolbar as cheaply as or more cheaply than with a tractor.

[1846] 633.491-1.81

HAWKINS, A.; CHUCKA, J. A.; MACKENZIE, A. J. **Fertility status of potato soils of Aroostook County, Maine, and relation to fertilizer and rotation practices.** *Me. Agric. Expt. Sta. Bull.* 454, 1947 (223-266). Hort. Abs. 19 (53).

On soils containing 500 lb./acre or more of readily-soluble P_2O_5 or 500 lb. of exchangeable K_2O, maximum yields were obtained with applications of 80-120 lb. of P_2O_5 and 100-200 lb. of K_2O.

[1847] 633.491-1.81

CROWTHER, E. M. **The manuring of potatoes.** *J. Roy. Agric. Soc. England* 109, 1948 (114-117).

[1848] 633.491-1.81

FERRO, R. B.; JONES, H. T. **Manuring the potato crop on wold land.** *Agriculture* 56, 1949 (32-34).

The thin soils of the high wolds to the north of the East Riding of Yorkshire, lying at 300-750 feet, are derived from chalk and contain flints. A basal dressing of 6 cwt./acre of $(NH_4)_2SO_4$ was applied together with 0, 4 and 8 cwt./acre of 18% super. and 0, 3 and 6 cwt./acre of 60% KCl, singly and in all combinations. Each year potatoes followed wheat which followed grazing seeds. Wheat stubble was ploughed 10 inches deep in November or December. Applications of K increased yields considerably. The effect of P was slight and the addition of super. without KCl depressed yield. Higher yields were not obtained by increasing K from 3 to 6 cwt. unless additional P was also given. K increased the total weight of tubers and reduced the proportion of chats. Plants receiving no K suffered from attacks of blight.

[1849] 633.491-1.816.32

COOKE, G. W. **Placement of fertilizer for potatoes.** *J. Agric. Sci.* 39, 1949 (96-103). [Rothamsted]

In 29 experiments, placement of fertilizer in contact with the seed or in sidebands 2 inches away from it and below it gave yields similar to those from broadcasting between ridging and planting. A single band 2 inches below the seed proved inferior to other placements and to broadcasting over the ridges. Broadcasting before ridging gave consistently lower yields than if carried out

after ridging. Fertilizer placed in contact with the seed severely checked growth in dry weather.

[1850] 633.491-1.85-1.811
PAAUW, F. VAN DER Opname, vorming en veredeling van de stof door de aardappelplant bij gevarieerde fosfaatvoeding. **[Absorption of phosphate and nitrogen, assimilation and structural distribution in potatoes grown under varied phosphate conditions.]** *Versl. Landbouwk. Onderzoek.* 54, 3, 1948, pp. 48. [Du.e.]

Potatoes were grown on a sandy soil poor in P with applications of 0, 60, 260 and 600 kg./ha. of P_2O_5 in the form of double super. Only the largest dressing produced maximum growth. N was absorbed from the soil under all conditions of P manuring until the tops began to die down.

[1851] 633.491-2-1.81
ROSS, A. F.; CHUCKA, J. A.; HAWKINS, A. **The effect of fertilizer practice including the use of minor elements on stem-end browning, net necrosis, and spread of leafroll virus in the Green Mountain variety of potato.** *Me. Agric. Expt. Sta. Bull.* 447, 1947 (97-142). Hort. Abs. 19 (53).

The amount of stem-end browning was positively correlated with the amount of Cl and K applied in the fertilizer, and that of net necrosis with the amount of P and Cl applied. Other fertilizer constituents had little or no effect. The tendency to increase in net necrosis on plots receiving high P was due primarily to the spread of leafroll virus on these plots. Recommendations include the use of fertilizers low in Cl, and reduction in the amount of P and K where such reductions can be made without decreasing yield.

[1852] 633.491-2.4-1.461
CANADA DEPARTMENT OF AGRICULTURE. **Soil micro-organisms in relation to potato scab.** *Canada Dept. Agric. Sci. Serv. Rept. 1947-48*, 1948 (33-34).

Two successive crops of soybeans caused a marked stimulation of bacteria requiring amino acids for maximum growth and depressed relatively those forms requiring the more complex ingredients of yeast and soil extract. In rye and clover-cropped soil, however, the effect on the incidence of these two groups of soil bacteria was reversed. Examination of tubers of potatoes subsequently grown in these soils and control soil showed that soybeans had caused a marked reduction in scab, whereas rye and clover had little or no effect. Coincident with the reduction in scab was a lowering of the pH of the soil to a more acid level, and a reduction in numbers of bacteria, actinomycetes and fungi in the immediate vicinity of the tubers (rhizosphere). The Bacterial Balance Index (the equilibrium between presumably 'harmful' and 'favourable' bacteria expressed on a numerical basis) showed a relationship with the degree of infection, reduction in scab being associated with a rise in the index.

[1853] 633.492-1.81
GEORGIA COASTAL PLAIN EXPERIMENT STATION. **Improved cultural practices for sweet potatoes.** *Ga. Coast. Pl. Expt. Sta. Mimeo. Pap.* 62, 1949, pp. 3.

800-1200 lb./acre of 4-8-8 fertilizer should be applied in bands on each side of the row or in the drill in a shallow furrow, and mixed with the soil. The fertilizer is covered with a disc or turn plough, thus building the ridge on which to plant. Applications of more than 1200 lb./acre should be split, part being applied before planting and part at first cultivation.

633.5 FIBRE CROPS

[1854] 633.51-1.4
GUERRA, E. C. Instrucciones para el cultivo del algodón. **[Instructions for cotton cultivation.]** *Agric. Trop. Bogotá* 5, No. 5, 1949 (9-11). [Sp.]

Suitable soils are level stretches of deep, easily worked sandy loam, spongy and granular, with good drainage and aeration. If sloping, a west aspect is preferable. Sand content should not exceed 60% and humus should not be too plentiful. Reaction needs to be as nearly neutral as possible.

[1855] 633.51-1.581-1.81
PEAT, J. E.; PRENTICE, A. N. **Land resting.** *Emp. Cott. Grow. Corp. Rept. 1947-48*, 1949 (87-88).

With rests under elephant grass, *Hyperrhenia*, giant cynodon, pigeon pea, green manuring and weedy cassava, there was a

first-year benefit of 40%. There was a small second-year benefit from pigeon pea and weedy cassava, but there was almost no benefit from grass. Manuring with 5-7 tons/acre of farmyard manure or compost gave good responses for at least 4 seasons on hill sands. On black loam the direct, first-residual and second-residual effect of 5 tons/acre was small and benefits from resting-crops were small, In a NPK trial on a heavy yielding cotton crop, the effects of N and P, though small, were significant.

[1856] 633.51-2.4-2.953
SMITH, A. L. **Soil fumigants for controlling Fusarium wilt and nematodes of cotton.** Abs. in *Phytopath.* 39, 1949 (499).

3.5 gall./acre of DD increased lint yield 45% and controlled wilt satisfactorily. 10 gall. of Iscobrome D (23% ethylene dibromide by weight) gave comparable results. 3.5, 7 and 14 gall./acre reduced emergence and 14 gall./acre gave abnormal plant type, presumably from N stimulation; emergence was not affected by Iscobrome D.

[1857] 633.52-1.432.2 : 581.192
PATERSON, G. R.; SPENCER, E. Y. **Some factors affecting the cyanogenetic content of flax.** *Canad. J. Res.* 27F, 1949 (225-230). [Univ. Sask., Saskatoon]

Flax maintained at high moisture level throughout the growing season contained significantly less linamarin than plants grown with less soil moisture. Flax grown at high moisture levels was more affected by frost, mechanical injury and drought than were plants grown at low moisture levels.

[1858] 633.52-2.954 : 577.17
PAATELA, J. **Artificial hormones and weed control in oil flax cultivations.** *Valt. Maatalousk. Julk.* 131, 1949, pp. 52. [Agric. Expt. Sta., Tikkurila, Finland] [E.fi.]

Sprays of 0.02-0.2% solutions of methoxone stimulated growth of oil flax within 18 hours after treatment. 0.1% methoxone sprays given at an early stage of development delayed flowering for one day and yellow maturity for 2 days and increased yield of seed and stem. Sprays given at a late stage of development reduced the yield and quality of seed and stem. At the cotyledon stage the Na salt of 2,4-D in aqueous solution was more injurious than a comparable amount of agroxone; at other stages it was less effective than agroxone. A recommended application for weed control in oil flax is 1 kg./ha. of agroxone at an early stage of development.

[1859] 633.52-2.954 : 577.17
TANDON, R. K. **The response of flax to rates and formulations of 2,4-dichlorophenoxyacetic acid.** *Agron. J.* 41, 1949 (213-218). [Univ. Minn.]

4 ounces/acre of 2,4-D as Na salt, amine salt or ester did not reduce the yield of tolerant varieties. The Na salt was the least and the ester the most injurious. It is possible that lower rates of ester are as effective for killing weeds and less liable to injure the crop.

[1860] 633.526.41-1.5
JACKSON, W. L. ***Phormium tenax*, New Zealand flax.** *E. Afric. Agric. J.* 14, 1949 (194-195).

Land should be thoroughly cleaned before planting and kept clean during the first year. During the rains after planting, lupins are sown thickly in the rows. The crop is drought resistant and is a soil renovator. If planted closely, couch grass is controlled. The leaf pulp makes good compost.

633.6 SUGAR CROPS

(*See also* Abs. No. 1934)

[1861] 633.61-1.81 : 581.192
LAL, K. N.; PATHAK, H. S. **Effects of fertiliser deficiency and sufficiency upon growth and development of sugar cane.** *J. Indian Bot. Soc.* 27, 1948 (30-40). B.A. BIII, 1949 (151).

Deficiency of N reduces weight, tillering and leaf size more than do deficiencies of P and K. The sugar content of the juice was increased by N deficiency and increased slightly by addition of P and markedly by K.

[1862] 633.61-2.191-1.811.9
STEINDL, D. R. L. **Droopy top disease of sugar cane.** *Cane Grow. Quart. Bull.* 11, 1948 (175-177).

The disease occurs on areas of poor sandy soil and is probably caused by a soil deficiency. Cu and Zn stimulated growth, but applications of $MnSO_4$ and S to affected areas had no effect.

[1863] 633.63-1.582
PAULES, L. H. **Nine sugar beet rotations compared.** *Wyo. Agric. Expt. Sta. Rept. 1947-48*, 1948 (49-52).

Yields for 9 rotations on irrigated land for 7 years are tabulated.

[1864] 633.63-2.4-2.9
HILDEBRAND, A. A.; MCKEEN, W. E.; KOCH, L. W. **Row treatment of soil with tetramethylthiuram disulphide for control of blackroot of sugar-beet seedlings. I. Greenhouse tests.** *Canad. J. Sci.* 27C, 1949 (23-43). [Dept. Agric., Ottawa]

Tetramethylthiuram disulphide (50%, nonwettable) applied as Arasan or D-419 at the rate of 3-4 lb./acre was by far the most effective chemical tested in reducing pre- and post-emergence black root. Arasan retained its fungicidal capability after being mixed for as long as 14 months with a commercial fertilizer. It reduced the incidence of the disease in a clay loam, a sandy loam and a clay and was effective in soil for 45 days. Best results were obtained when the seed germinated in, and the seedlings grew up through, soil impregnated with Arasan-fertilizer mixture. Up to 21°C., Arasan at a rate as high as 4 lb./acre controlled the disease in a moderately wet soil without injury to seedlings. At 27-29° using 3 lb./acre there was moderate injury to roots and lower hypocotyl, and following a 4-lb. application foliar symptoms and mortality of seedlings also occurred.

633.7 STIMULANTS

(*See also* Abs. Nos. 1641, 1909, 1941, 1965)

[1865] 633.71-1.5
BROWN, D. D. **Preliminary notes on cigar tobacco culture.** *Rhod. Agric. J.* 46, 1949 (48-58).

Republished, amended, from *ibid*, 1946. See *Soils and Fert.* X, p. 347.

[1866] 633.71-1.582
CARTMILL, W. J.; TARRANT, R. A. **Restoring the productivity of worn-out tobacco soils in the Miriam Vale District.** *Queensland Agric. J.* 68, 1949 (196-207).

Miriam Vale soils will produce only one satisfactory tobacco crop after the land has been broken up, and on land which has been rested for 4-5 years tobacco becomes infested with nematodes. Soil organic matter can be built up by rotational cropping which includes a cover crop for at least 2 years. The land should be ploughed or harrowed in early summer following the tobacco harvest, and sown with 10 lb./acre of Gambia pea or 10-15 lb./acre of Rhodes grass or a mixture of the two. Stock should be kept off until the crop is well established and overgrazing should be avoided. The cover crop should be ploughed in 2 months before planting tobacco. If the content of soil organic matter is satisfactory, the effects of nematodes are negligible.

[1867] 633.71-1.83 : 581.192
TORRE, J. R. DE LA **The effect of potassium on the efficiency and the composition of the tobacco leaf of Pennsylvania.** *Rev. Soc. Cubana Ing.* 44, 1947 (875-896). C.A. 43 (4802).

Increase in the amount of K applied up to 180 lb./acre was followed by an increase of assimilable K and of the K content of the plant. Application of 240 lb./acre decreased efficiency. The quantities of K absorbed were always less than 60 lb./acre. The K content of the plant does not affect the N content. Application of K did not improve tobacco quality.

[1868] 633.72-1.62
TOCKLAI EXPERIMENTAL STATION. **Drainage—basic principles.** *Tocklai Expt. Sta. Serial* 51, 1949, pp. 3.

For tea gardens on plain or gently undulating land recommendations are made for size, depth, distances, gradients, isolating drains to protect low-lying areas and the plugging of drains in the dry period.

[1869] 633.72-1.81
TOCKLAI EXPERIMENTAL STATION. **Making the most of fertilizers.** *Tocklai Expt. Sta. Serial* 47, 1949, pp. 3.

Advisory for planters, indicating fertilizing priorities, effect of shade, rates of application and methods of economizing.

[1870] 633.79-1.4 : 581.144.2
LAMBERT, J. G. Note sur le système radiculaire du houblon. **[Note on the root system of the hop.]** *Ann. Gembloux* 55, 1949 (88-90). [F.]

A presentation of Beard's work on the relationship between root shape and soil. (See *Soils and Fert.* VII, p. 44.)

633.8 AROMATIC, MEDICINAL AND OIL PLANTS

(*See also* Abs. Nos. 1925, 1953)

[1871] 633.821-1.81
BOURIQUET, G. Les engrais chimiques et le vanillier. **[Chemical fertilizers and vanilla.]** *Agron. Trop.* 3, 1948 (497). [F.]

The observed lack of response of the vanilla plant to inorganic fertilizers is recorded.

[1872] 633.841-1.5
CHOUDHURY, S. **Black pepper growing in Assam.** *Indian Farm.* 8, 1947 (557-559). [Pl. Path. Lab., Sylhet, Assam]

Planting out should be done at the beginning of the rains and only one plant should be planted to each tree on which it is to grow. Cow dung and household refuse are applied around the base of the tree at the end of the rains and at intervals throughout the cold weather. In Bombay, manure made from green leaves and twigs plucked during the monsoon and used as litter in cattle byres is applied in March or April. Fish guano at the rate of $\frac{1}{4}$-1 lb. per vine + 1 lb. of lime mixed with 20 lb. of leaf mould per vine is also recommended in Bombay.

[1873] 633.852.52-1.83-1.816.32
OHLROGGE, A. J. **Effect of placement of fertilizer on peanut yields.** *Proc. Natl. Joint Ctee. Fert. Appl.* 23, 1947 (222).

5-year trials show that germination was little affected if K fertilizers were placed in bands 2 inches to the side of the seed, regardless of the source of K. Germination was retarded if bands were nearer or directly under the seed when fertilizer of high salt index was used. When moisture was deficient during germination fertilizer injury was severe.

[1874] 633.853.48-1.5
GARBER, K. Über den Anbau von Conringia orientalis (L.) Andrz. (Dum.) als Ölpflanze. **[The cultivation of *Conringia orientalis* (L.) Andrz. (Dum.) as an oil plant.]** *Bot. Oecon.* 1, 1948 (38-48). [G.e.f.r.]

The crop is cultivated and fertilized in a similar way to other brassicas such as summer rape and mustard. 20 kg./ha. of seed at a 25-cm. row distance in a loamy sand yielded 700 kg. of seed with oil and raw-protein contents of 28.5 and 22.6% respectively. It resists flea beetle, is immune to *Meligethes aenus* but is often seriously damaged by *Botrytis*. The oil is non-drying and suitable for table use, but cultivation in Germany, because of the low yield, should await breeding work.

634 ORCHARDS. FRUIT

[1875] 634-1.51
LOEWEL, E. L.; MAUCH, A. Erfolgreiche Bodenbearbeitung im Obstbau. **[Soil cultivation in orchards.]** *Ceres, Hamburg* 1, 1948 No. 7/8 (21-22). Hort. Abs. 19 (18). [G.] [Jork Fruit Expt. Sta., Germany]

A method has been developed of harnessing a horse or tractor at the side of an implement so that soil may be cultivated right up to the trees under branches 27 inches high. Branches hanging to the ground are lifted without damage by a gliding plane attached to the implement. The track of the horse or tractor runs 3-10 feet to the side of that of the cultivator, according to the size of the trees.

[1876] 634-2.191 : 546.72
ZANOTTI, L. Il solfato di ferro. **[Iron sulphate.]** *Ital. Agric.* 85, 1948 (273-274). Biol. Abs. 23 (921). [I.]

The application of 2-3 qu./ha. of iron sulphate is recommended as a fertilizer for orchards. For controlling "marciume" disease of roots, iron sulphate should be mixed with liquid manure.

[1877] 634.1/2-1.811
WALLACE, T. **Nutrition of farm crops. VIII. Bush and cane fruits and strawberries. IX. Tree fruits.** *Farming* 3, 1949 (167-171, 199-204).

Soil conditions, special mineral requirements of various fruits and manurial treatments are discussed.

[1878] 634.11-2.191 : 546.47
WADE, G. C. **"Little leaf" of apples.** *Tasm. J. Agric.* 20, 1949 (101-102).

"Little leaf" is due to unavailability of Zn in the soil. Zn added to the soil soon becomes unavailable to plants. Spraying in late winter with a solution of 50 lb. of $ZnSO_4$ in 100 gallons of water is recommended. One spray lasts 2 or 3 seasons.

[1879] 634.11-2.192 : 546.711
CLULO, G. **The production of internal bark necrosis of apple in sand and soil cultures.** Abs. in *Phytopath.* 39, 1949 (502).

Incidence and severity of the disease were increased when $MnSO_4$, H_2SO_4 or S was added to two soils, one on which the disease always developed and one where apples had been grown for 20 years without disease. $(NH_4)_2SO_4$ and $NaNO_3$ added to the disease-producing soil increased the incidence and severity. When $Ca(OH)_2$, $CaCO_3$, $MgCO_3$, MgO or Na_2CO_3 was added to disease-producing soil the development of the disease was prevented and the soil pH was increased to 6.3-7.5. Trees planted in soil treated with $Ca(OH)_2$ have not become diseased during a 10-year period. The disease was produced by adding 64 p.p.m. or more of Mn as $MnSO_4$ to sand cultures.

[1880] 634.3-1.51
JOHNSTON, J. C.; SULLIVAN, W. **Eliminating tillage in citrus soil management.** *Calif. Agric. Ext. Serv. Circ.* 150, 1949, pp.16.

Systems of (1) complete non-cultivation involving no cover crop and no tillage, (2) winter cover-cropping with summer tillage and (3) permanent cover-cropping with no tillage are discussed. Methods employed in (1), equipment needed, results and costs are described. The land is levelled and prepared for irrigation in late spring or early summer. No special irrigation method is required. Weeds are sprayed when one inch high. Using this method the physical condition of the soil and water penetration are improved, less N fertilizer seems to be necessary, erosion is reduced and yield is increased. The effect of oil spray on the soil is negligible.

[1881] 634.3-2.191 : 546.77
VANSELOW, A. P.; DATTA, N. P. **Molybdenum deficiency of the citrus plant.** *Soil Sci.* 67, 1949 (363-375).

Rooted lemon cuttings in solution cultures highly purified with respect to Mo developed characteristic leaf mottling and necrosis when their original Mo had become attenuated by new growth. Incipient mottling occurred when the leaf Mo content fell to 0.024 p.p.m. of dry weight; leaves of plants in solutions supplied with 0.001 p.p.m. of Mo contained 0.2-0.3 p.p.m. Additions of Mo as low as 0.0001 p.p.m. to the culture solutions caused recovery in a few months and spraying of a small portion of the foliage with a soluble Mo compound caused recovery of the whole plant. Neither Co, Cr, Ni, Re, V nor W supplied at 0.001 p.p.m. in the nutrient solutions reduced the deficiency symptoms. These symptoms developed even when the plants were well supplied with N as NH_4 salts.

[1882] 634.3-2.192 : 546.27
PENMAN, F.; MCALPIN, D. M. **Boron poisoning in citrus.** *J. Dept. Agric. Victoria* 47, 1949 (181-189).

B poisoning probably caused by B in the soil occurs on irrigated heavy soils in northern Victoria. Symptoms occur when the B content of dry matter of citrus leaves exceeds 500 p.p.m. Water-soluble B in the soils where the injury occurs varies up to 16 p.p.m. or more, and B content may increase with depth. Some occurrences of unthriftiness and defoliation previously attributed to accumulation of chloride in the soil may be due to B poisoning. The restriction of citrus planting to deep, permeable sands is the prime control measure. Water penetration should not be impeded, the soil surface should not be allowed to compact and the water table should be kept low.

[1883] 634.3-2.4-1.432.2
FRASER, L. **A gummosis disease of citrus in relation to its environment.** *Proc. Linn. Soc. N.S.W.* 74, 1949 (v-xix).

Phytophthora citrophthora is so widely distributed that it is always present in New South Wales soils in which citrus grows. Young trees whose roots spread into new uninfected soil are more likely to survive an

attack following unusually high soil moisture than are old trees. Young trees should be planted in freely-draining soils.

[1884] 634.334-1.5

CHOUDHURY, S. D.; BHATTACHARYA, S. C.; DUTTA, S. **Cultivation of Assam lemon.** *Indian Farm.* 8, 1947 (554-556). [Citrus Fruit Res. Sta., Burnihat, Assam]

Assam lemon grows in a wide range of soils and climate and thrives on sandy loam or loamy soil rich in humus with an annual rainfall of 60-150 inches. It grows at an altitude of up to 4000 feet. An effective soil mulch must be maintained during the dry season. The plantation should be kept free from weeds which might compete with the crop for moisture and nutrients. The Assam lemon fruits prolifically throughout the year and requires 2 lb. of K_2SO_4 and 3 lb. of $(NH_4)_2SO_4$ per tree per year, a half in January and a half in September. Fertilizers should be applied between the trees leaving a radius of 2 feet from the trunk. They should not be applied during the rains and should always be preceded by a liberal dressing of well-rotted cow dung or compost.

[1885] 634.441-1.8

STEPHENS, S. E. **The mango.** *Queensland Agric. J.* 68, 1949 (208-215).

The mango tree requires fairly large applications of N during early growth, and P and K fertilizers once fruiting has begun.

[1886] 634.461-1.5

TAKAHASHI, M.; RIPPERTON, J. C. **Koa Haole (*Leucaena glauca*).** Its establishment, culture and utilization as a forage crop. *Hawaii Agric. Expt. Sta. Bull.* 100, 1949, pp. 56.

[1887] 634.571-1.5

BULLETIN OF IMPERIAL INSTITUTE. **The cultivation of the litchi.** *Bull. Imp. Inst.* 46, 1948 (238-242).

In China the litchi tree is planted along dykes surrounding cultivated land or on raised beds at least 3 feet above water level or on terraced hillsides. Loam soil is desirable. The tree grows well on Canton delta soils, and on sandy loam with clay subsoil in upland areas. Nightsoil is usually used for manuring. In S. Africa the tree is grown in Eastern Transvaal lowlands on deep loamy soil. Acid soils give the most vigorous growth. Irrigation is essential with a well-distributed rainfall of less than 50 inches. In India, the tree is grown on highly-calcareous, deep alluvial loam.

[1888] 634.8-1.81

COPEMAN, P. R. v.d. R. **Equations of growth.** *S. Afric. Indust. Chem.* 2, 1948 (188-190). B.A. BIII, 1949 (145).

Equations of growth are discussed. Determinations of the acidity and sugar content of three varieties of grape and of the height of oat plants grown under the same climatic conditions, but with eight different fertilizer treatments, are reported.

634.9 FORESTRY

(*See also* Abs. No. 1798)

[1889] 634.9-1.4

LUNT, H. A. **The forest soils of Connecticut.** *Conn. Agric. Expt. Sta. Bull.* 523, 1948, pp. 93.

The geology, topography, climate and physical, chemical and biological properties of the soils are described. A condensed history of land use in Connecticut is given; 60% of the land area is now in forest or brush. The composition of the forest litter is discussed in relation to soil characteristics. Lysimeter studies show that nutrients are taken up by the roots as rapidly as they become available and that normally no permanent loss occurs. N transformation continues into the winter and the concentration of all nutrients is frequently as high then as at any other time. Pot-culture studies show that surface organic debris causes a high mortality in spruce seedlings that is greatly reduced when this material is burned or turned under. P, alone or with N, improves growth. Compared with cultivated and pastured soils woodland soils are more acid and lower in exchangeable Ca, but are in better physical condition, have higher moisture-holding and base-exchange capacity and contain more N. Burning increases Ca and pH and decreases available P and K. Application of lime has a greater influence on N availability than has burning.

[1890] 634.9-2-1.4
DAY, W. R. **Forest pathology in relation to land utilization.** *Emp. Forestry Rev.* 28, 1949 (110-116).

Forestry, particularly in Britain, is relegated to poor soils. Apart from climatic changes, extreme variations in water and food supply are pathogenic factors, both directly and as conducive to parasitic disease. Primary factors determining soil fertility are depth, structure, texture and water conditions, whereas cultural operations are of secondary significance. Poor or decreasing fertility demands extra care in selection of species and strains best adapted to local conditions.

[1891] 634.957
GOSLING, A. H. **Developments in the afforestation of poor soils.** *Brit. Agric. Bull.* 1, 1949 (185-190).

[1892] 634.975-1.4 : 581.144.2
DANILOV, M. D. **[The distribution of roots in the horizons of soils of felled and burnt areas of pine plantations.]** *Pochvovedenie* 1949 (205-211). [R.]

In sandy podzolic soils with layers of clayey sand and in podzolic clayey sands with sandy layers, under forest canopy and in felled or burnt areas, there was, in soils with well-developed horizons, a closer relationship between the root distribution and the genetic horizons than in dry weakly- and cryptopodzolic soils and the root mass was 2-5 times as great. On recently cut and especially on recently burnt areas, with luxuriant willow herb, the root mass was distributed fairly evenly with no clearly defined concentration of roots, especially small roots, in the upper humus horizon, but in older burnt areas, overgrown with grasses, there was a strong concentration of roots and stolons in this horizon, thus considerably worsening the conditions for the establishment of young tree plants.

[1893] 634.975-1.414.2
AREND, J. L. **Hardpan development in the Landes region of France.** *Ecology* 29, 1948 (375-376). [S. Forest Expt. Sta., New Orleans]

Growth of *Pinus pinaster* on this sandy plain of 2 million acres is declining. Before the Landes was drained and trees planted in 1865-75, soil acidity was high. Organic matter accumulated slowly because of successive inundation and drought, and frequent fires. The infiltration capacity of the soil was high and the water table was shallow. A hardpan layer had begun to develop at an unknown depth over about half the area. Under pine forest with fire protection, acid organic debris and infiltration capacity have increased and acid organic matter has been carried by rainfall to the shallow water table. The hardpan layer now averages 30-40 cm. in thickness and extends over 60-80% of the Landes, hindering root development. Internal drainage is restricted and in wet periods there are two water tables, one above and one below the hardpan.

[1894] 634.975-1.416.862.1
SÜCHTING, H. Untersuchungen über die Ernährungsverhältnisse des Waldes. X. Über die Wirkung des löslichen Aluminiums zweier Waldböden auf die Kiefer. **[Investigations on nutrition conditions in forests. X. The effect of soluble aluminium on pines in two forest soils.]** *Z. PflErnähr. Düng.* 42, 1948 (193-218). [G.]

Subject of this paper was to prove the effect of soluble Al on the growth of pines (*Pinus silvestris*) under natural soil conditions. Two years' pot experiments in a diluvial sand and a loamy soil, both with high Al content, showed that: Al soluble in 1% citric acid caused in both soils a yield depression up to 50%.

In an additional experiment with a mixture of quartz sand and 7% humus the same negative effect was observed when an amount of $Al(OH)_3$ equal to that found in the two other soils (400 mg./100 g.) was added. No growth injury occurred when Al_2O_3 content of the soil was less than 100 mg./100 g. The effect of the reaction of the soil in the presence of much soluble Al was negligible, but the growth of seedlings in soils poor in Al was best at pH 4-5.

The uptake of Al_2O_3 by the plant was related to the soluble-Al content of the soil. Plants from soils with high Al content contained 0.2-0.3% of Al_2O_3, while plants from the quartz-sand humus mixture contained only 0.04-0.09%. Recovery of P by plants in soils with high soluble Al was very low (1-2 mg.) in spite of an application of 80 mg. of readily soluble P to the pots.

When the soluble Al was removed the recovery of fertilizer P by the plant amounted in certain cases to 40%. The application of lime to soils with much soluble Al increased the P recovery with a maximum at pH 4-5. Added $Al(OH)_3$ caused exactly the same negative effect on the uptake of P as the soluble Al of the soil.—B.F.G.

[1895] 634.975-1.417 : 634.972
MAŘAN, B. **[The influence of beech undergrowth on forest-soil properties in the pine woods at the National Forest Lipicí near Třeboň.]** *Sborn. Čsl. Akad Zeměd.* 19, 1946 (286-290). C.A. 43 (3553).

In the horizons of strongly-podzolized soils the chemical properties of the surface humus are more favourable in pine woods with beech undergrowth than without. This favourable effect is increased by the decaying matter of beech and oak stumps, since they are more nutritious and less acid than the decayed pine stump. In the top surface of the soil under the beech growth, Ca was increased 6 times, Mg 3, K 3.5 and H_3PO_4 4 times, while soluble N was doubled and acidity lowered as compared with soil without undergrowth. Under these conditions the degradation process was essentially retarded or stopped.

[1896] 634.975-2.191-1.432.2
COPELAND, O. L. **Some relations between soils and the littleleaf disease of pine.** *J. Forestry* 47, 1949 (566-568). [Bur. Pl. Indust., U.S.D.A.]

Poor internal drainage of soils appears to be a major cause of littleleaf in *Pinus echinata* M ill.

635 HORTICULTURE

(*See also* Abs. Nos. 1721, 1794, 1806, 1827)

[1897] 635-1.416 : 581.192
VOLK, G. M.; SIMS, G. T. **Effect of soil on the mineral composition of commercially grown vegetables.** *Proc. Fla. St. Hort. Soc.* 60, 1947 (138-141). C.A. 43 (2722).

Analyses of cabbage, beans, celery and tomatoes showed that composition of the plant was not always affected by the constituents of the soil.

[1898] 635-1.67-1.347.24
SECRETT, F. A. **The use and abuse of artificial irrigation on horticultural crops.** *J. Roy. Hort. Soc.* 74, 1949 (282-288).

Plants are affected by insect pests most seriously during periods of drought; attacks can be controlled by applying overhead irrigation, especially if a 10% solution of KNO_3 be added to the irrigation water. Trace elements in solution can be added to irrigation water. Oxygen may be added by using a small compressor; air is passed under pressure through an atomizer fitted across inside the main. Irrigation should be avoided on heavy soils and badly drained land. At least 30 tons/acre of composted straw or stable manure should be added to give crumb structure. After irrigation, as soon as the soil is friable, the surface should be hoed to a depth of 2-3 inches.

[1899] 635-1.81 : 577.16
CHEN, C-Y.; YI, L.K .; TUAN, M. T. **The effect of fertilizers on the ascorbic acid content of vegetables.** *Nutr. Res. Bull.* 7, 1948 (14-16). C.A. 43 (3958).

Neither chemical fertilizer nor manure affected the ascorbic-acid content of amaranth.

[1900] 635.13-1.3
DARBY, F. M. **Mechanizing the carrot crop.** *Agriculture* 56, 1949 (61-63). [Norfolk Agric. Exec. Ctee.]

Mechanization of sowing, weed control and harvesting has been investigated on a light black fen soil on which yields of over 20 tons/acre of carrots are obtained. Spraying with commercial P.V.O. has been successful in controlling weeds.

[1901] 635.262-1.5
SIMONNEAU, P. L'ail d'Orient. **[The garlic *Allium ampeloprasum* L.]** *Ann. Inst. Agric. Algérie* 3, 1946 (3-20). [F.]

This garlic is as yet little studied and is sensitive to rust. The studies refer to plants on an irrigated calcareous sandy clay rich in nutrients. 500-600 q./ha. of manure are spread 10 months before planting and 2 mattockings are given, at a month's interval, before planting the offset bulbs in October-January at 15 cm. apart on the upper third of both sides of ridges 60-70 cm. apart. One or 2 hoeings are given as required by weed

growth. Recommendations are made concerning cultural methods of obtaining large bulbs, and for the use of the "cloves" or external bulbules for planting purposes.

[1902] 635.31-1.81
AMERICAN FERTILIZER. **Commercial fertilizers better for asparagus.** *Amer. Fert.* 110, No. 9, 1949 (22).

Asparagus yields are increased more by commercial fertilizers than by manure or chopped-up hay. The commercial fertilizer supplies enough N to break down the disced-in tops of asparagus and leave a surplus for the growing crop. In experiments enough of each kind of fertilizer was added to supply 200 lb./acre of N. This required 20 tons of manure or 4 tons of chopped hay.

[1903] 635.35-2.191 : 546.77
WARING, E. J.; WILSON, R. D.; SHIRLOW, N. S. **Whiptail of cauliflower. Control by the use of ammonium molybdate and sodium molybdate.** *Agric. Gaz. N.S.W.* 59, 1948 (625-630) ; 60, 1949 (21-26).

The easiest method of control appears to be to water the seedlings in the seedbed with a solution of a soluble Mo compound one or two weeks before transplanting. For field applications after transplanting it is recommended that 1 lb. of ammonium molybdate or 3 lb. of crude (43%) sodium molybdate be applied to each acre. The most effective method is to dissolve the material in water and apply to the base of each plant. It may be found easier to mix the material with ordinary fertilizer and apply it as a side dressing.

[1904] 635.52-1.67
VEIHMEYER, F. J.; HOLLAND, A. H. **Irrigation and cultivation of lettuce. Monterey Bay Region experiments.** *Calif. Agric. Expt. Sta. Bull.* 711, 1949, pp. 52.

The soils used for lettuce production in this area range from sandy loams to clay loams and are fertile but often not well drained. Rain in appreciable amounts is rare in summer and autumn. Evaporation is reduced for some hours each day by the presence of cool ocean fogs. The lack of lateral roots in lettuce and the presence of much soil not occupied by roots makes soil-moisture recording an unsafe guide to the plant's water requirements, which for a summer crop averaged 3,95 inches and 3.16 for an autumn crop. Three irrigations only, at germination, thinning and 30 days after thinning, and totalling about 14 inches, produce a crop without losses in yield or quality. Cultivations after planting should be limited to those needed to control weeds.

[1905] 635.615-1.5
GEORGIA COASTAL PLAIN EXPERIMENT STATION. **The production of watermelons in the coastal plain of Georgia.** *Ga. Coast. Pl. Expt. Sta. Mimeo. Pap.* 63, 1949, pp. 4.

Watermelons grow best on light, well-drained, loamy soils with clay subsoils. New land is preferable as in old land there is lack of anchorage which allows vines to be rolled by the wind. Watermelons should be grown in rotation with non-related and nematode-resistant crops and should not occur in the rotation oftener than once in 4-5 years. Land infested with wilt should be permanently abandoned for watermelons. Before planting, land should be turned sufficiently in advance to allow all plant matter to decompose. 800 lb./acre of 4-8-8 fertilizer should be applied before planting and followed by topdressing with 100-150 lb./acre of 10-0-10 when the vines are 2 feet long. Barnyard or stable manure should not be used as they are frequently contaminated with melon diseases. Shallow cultivation should begin soon after plants emerge.

[1906] 635.8-1.875
COURTIEU, P.; CHAPUIS, G. Champignons de couche et fumier artificiel. [**Cultivated mushrooms and artificial manure.**] *C.R. Acad. Agric.* 35, 1949 (299-303). [F.]

Average mushroom yields of 53.3 kg./ton of artificial farmyard manure based on straw or rushes have been obtained, with limits of yield of 28.3 and 133.5 kg./ton. The manure must be brought to a physical and chemical composition close to that of horse manure. A considerable part of the added N is in the form of animal or vegetable proteins of which no details are provided.

GEOGRAPHICAL

(4) EUROPE

(*See also* Abs. No. 1843)

[1907] (411)631.61
STEWART, A. B. **Improving marginal land.** *Dept. Agric. Scotland Leafl.* 4, 1949, pp. 12. [Macaulay Inst., Aberdeen]

Much of the land classed as marginal is badly drained, and drainage should first be undertaken. Where the soil is formed on boulder clay or drift, the soil may be deepened by subsoiling in autumn. On heavy soils deep ploughing may cause plough pans which may be eliminated by subsoiling and ploughing in lime. Fairly heavy and frequent rolling, especially on peaty soils and soils high in organic matter, helps newly sown grass and clover to get established. A suitable rotation for land that can be ploughed is oats or potatoes, roots or oats, oats and grass seeds, and pasture for 4 years. Rape or oats or barley may be grown as a nurse crop for grass and clover.

Lime and P deficiencies are widespread in Scotland. Lime in any form should be applied to overcome initial deficiency and a dressing of at least 2 tons/acre of ground limestone should be applied every 5 or 6 years. For oats 3 cwt. of super. should be applied with the seed followed by a top dressing of 1-2 cwt. of nitro chalk or 1-1½ cwt. of $(NH_4)_2SO_4$. For potatoes at least 10 cwt./acre of fertilizer mixture containing 5-6% of N, 10% of P_2O_5 and 10% of K_2O should be applied after the first and before the second ridging for planting. For turnips and swedes an average dressing of dung should be followed by 1½ cwt. of $(NH_4)_2SO_4$, 1 cwt. of KCl, 3-4 cwt. of super. and 3-4 cwt. of ground mineral phosphate. On land well dunged for a previous root crop, land for oats, barley or direct seeding to grass should receive 5-6 cwt. of super. and 1-1½ cwt. of KCl before seeding. If necessary a top dressing of 1-1½ cwt. of nitro chalk or ¾-1¼ cwt. of $(NH_4)_2SO_4$ may be applied. More N will be needed for a crop following potatoes than for one following turnips. Barley generally requires less N and grass more N than do oats. A top dressing of 2 cwt. of nitro chalk or 1½ cwt. of $(NH_4)_2SO_4$ should be given 10 days after grass seed has been sown. Moderately heavy P dressings should be made to pasture during autumn and winter of the first year and subsequently every 1 or 2 years.

[1908] (42)63
STAMP, L. D. **The geographical background to West of England farming.** *Agriculture* 56, 1949 (139-142).

[1909] (42)633.79-1.5
WILKINSON, E. H. **Hop-growing in the West Midlands.** *Agriculture* 56, 1949 (160-162).

Over a 3-year period 20 tons/acre of manure, 2 tons/acre of shoddy and 2 tons/acre of ground limestone are applied to hops. During each growing season these are supplemented by applications of balanced fertilizers, but the quantity of N used is less than that recommended for Kentish soils. The soil is ploughed in winter and is constantly cultivated with deep scuffles and rolled to eliminate weeds.

[1910] (427)633.491-2.2
THOMPSON, H. W. **The potato eelworm in Yorkshire.** *J. Yorks. Agric. Soc.* No. 100, 1949 (36-43).

Historical note on eelworm in Britain, distribution in Yorkshire, influence of soil types on distribution. Control measures and field surveys in affected areas are discussed.

[1911] (438)631.4
DOBRZAŃSKI, B.; UZIUK, S. Żyzność gleb Zakładu Naukowo- Doświadczalnego Turka. **[Fertility of the soils of the Turka Experimental Station.]** *Ann. Univ. Mariae Curie-Skłodowska* 3E, 1948 (197-206). [Pl.e.]

[1912] (438)631.4
STRZEMSKI, M. Gleby doliny Wisły. II. Odcinek : Kamień-Kazimierz Dolny. **[The soils of the Vistula valley. II. Section Kamien-Kazimerz on the right bank.]** *Ann. Univ. Mariae Curie-Skłodowska* 3E, 1948 (155-172). [Pl.f.]

[1913] (44)631.415.3
GOUNY, P.; MAZOYER, R. Les sols de la zone cotière du sud-est de la France. 2. Sols salins en Provence orientale. **[Soils of the coastal zone of south-east France. 2. Saline soils of eastern Provence.]** *Ann. Agron.* 19, 1949 (330-342). [F.] [Sta. Agron. Biochim. Végét., Antibes]

Two series of soils were studied in which salinity was hindering crop production.

In the Hyères region, content of soluble alkali and alkaline-earth salts increased towards the surface, and surface accumulation occurred. In spite of generally high saturation of the absorbing complex with Na, the presence of neutral salts and $CaCO_3$ prevented dispersion of the clay.

Non-calcareous, slightly acidic soil of the Reyran valley had only small amounts of soluble salts, but had reached a more advanced stage of evolution involving structural dispersion and a pH rise of two units above that of adjacent similar but well drained soils. Despite absence of alkaline carbonates, this soil should be classified as solonets. Evolution of solonets from solonchak proceeds by increased Na saturation of the absorbing complex.

[1914] (44)633.18-1.5
GARY, M. La culture du riz en Camargue. **[Rice cultivation in the Camargue.]** *Potasse* 23, 1949 (82-85). [F.]

Weed control, in the absence of sufficient knowledge of the effects of hormone weed-killers in irrigated rice, is usually effected by rotating one crop of rice with a cleaning crop of safflower which is sown with lucerne which is left down for 2 years. In calcareous soils fairly rich in N, with a moderate available-P content and low in available K, the recommended fertilizing is 300 kg./ha. of $(NH_4)_2SO_4$ (or 100 kg. after lucerne), 800 kg. of super. and 300 kg. of KCl. In the permeable sands of the lower Camargue an organic manuring together with divided fertilizing is being studied.

[1915] (44)634.8-1.4
MATHIEU-REVERDY, G. Contribution à l'étude du sol, de la vigne et du vin dans le Sud-Ouest. **[A study of the soil, grape vines and wine in the South-West.]** *Ann. Agron.* 19, 1949 (166-183). [F.]

Includes short studies of the climate, geology, topography and soils, most of which are more or less podzolized and produce wines of quality. The soils are popularly classified as *terreforts* (stiff soils)—a term also used, however, of all soils derived from Aquitanian sandstones except the very sandy soils—and *boulbènes*, a vague term covering soils of various textures and geological origins.

[1916] (45)631.4
PETROSINI, G. Studi sul suolo nelle terre del basso Volturno. **[Study of the soils of the lower Volturno valley.]** *Opera Naz. Combattenti* 5, 1949, pp. 53. [I.]

[1917] (45)631.4
PRINCIPI, P. I terreni agrari della Venezia Euganea. **[Agricultural soils of Venezia Euganea.]** *Ital. Agric.* 86, 1949 (302-312). [I.]

The region extends west and north from Venice and includes all types of landscape from dolomitic Alps to recent delta and littoral dunes. A map of soils based largely on parent material is given. Pedological descriptions are absent. The greater part of the area belongs to the pedoclimatic zone of brown earths. True brown earths with a neutral reaction, a well developed profile, and generally covered with forest, are encountered on the southern margin of the alpine chain up to about 1000 metres; above this, particularly on some sandy forested soils, podzolization is more or less evident. Some of the higher dolomitic soils have rendzina characters. A climatic *terra rossa* is found on limestone of the foothills below 1000 m.; vegetation on these soils is poor, and rainfall does not exert its full soil-forming effect because the rock is fissured. Upland soils not covered with forest are usually shallow and immature because of the tendency to form scree and alluvium. Heavily-leached and partly podzolized soils are found on morainic, fluvio-glacial and old alluvial deposits of the uplands; between these and the recent alluvium near the coast is a belt of sandy soils. Saline soils (once covered by the sea) are common near the sea; some have been reclaimed. Organic soils exist near the sea, and in a few higher-lying areas near Padua. The sands along the coast have been largely brought under irrigated market-gardening; water is obtained mainly from shallow wells.—R.N.

[1918] (45)631.473
SCURTI, F. **[Cultivated soils of the Piedmont from the agricultural and soil chemical standpoints.]** *Atti Accad. Sci. Torino Classe Sci. Fis. Mat.* 81-2, No. 1, 1945-46, 1946-47 (50-58). C.A. 43 (3125).

A general commentary on the completed soil survey of the area and the pH, K and P status of the various soil types with lists of soil minerals.

[1919] (45)631.67
SANTINI, C. La bonifica del Sarno. **[The Sarno basin land-improvement scheme.]** *Ital. Agric.* 86, 1949 (277-280). [I.]

The Sarno valley east of Vesuvius, is actually or potentially fertile and has benefited from canals constructed more than a century ago, but its full development has been hindered by partitioning among four land-improvement bodies. A single authority is about to be formed, and it is proposed to spend some 2,500,000,000 lire mainly on schemes whereby control of mountain streams and drainage works will be linked with irrigation from streams and wells.—R.N.

[1920] (45)633.18-1.5-1.3
PIACCO, R. **[Mechanization in Italian rice cultivation.]** *Risicoltura* 36, 1948 (274-279); 37, 1949 (9-15, 38-43). B.A. BIII, 1949 (186).

[1921] (45)633.18-1.85
CHIAPPELLI, R. **[Phosphatic fertilizers in rice fields.]** *Risicoltura* 36, 1948 (264-265). B.A. BIII, 1949 (147).

The replenishment of rice soils exhausted of P and other necessary elements is discussed. In soils relatively rich in organic matter, Italian phosphate with slight alkaline reaction and containing about 31% of P_2O_5 is suitable; in others, super. may be preferred. In recent tests, Italian phosphate or phosphorite has often proved superior, especially where CaO is required to avoid losses of N and assist the decomposition of organic matter.

[1922] (46)631.4.061.6
ALBAREDA, J. M.; BURRIEL, F.; MUÑOZ TABOADELA, M. Manganeso total en relación con el color de las tierras negras andaluzas. **[Total manganese content and the colour of Andalusian black soils.]** *An. Inst. Esp. Edafol.* 7, 1948 (439-488). [Sp.e.f.]

The soils, which were sampled in Seville province, were of a more or less dark grey with some tending towards red; wetting caused great changes of colour. They are calcareous, very clayey, contain usually small amounts of salts and are neutral or slightly alkaline. The clay content and the organic-matter content of 1.99% are rather higher than those of the calcareous red earths of the same region, as are also the exchange capacity and moisture content. There was no relationship between Mn content and colour of the soils, which was due to the nature of the humus.

[1923] (469)633.18-1.5
PIACCO, R.; SERRA, A. **[Rice cultivation in Portugal.]** *Risicoltura* 36, 1948 (270-273). B.A. BIII, 1949 (147).

[1924] (47)633.854.56-1.5
BULLETIN OF IMPERIAL INSTITUTE. **The cultivation of tung trees in the U.S.S.R.** *Bull. Imp. Inst.* 46, 1948 (57-61).

The history of the crop, areas of cultivation, influences of day length, temperature, humidity, altitude and soil are discussed. In spite of unfavourable ecological conditions, the acclimatization of tung in sub-tropical Russia has been attained.

[1925] (47)633.854.78-1.5
TKATCHENKO, B. La culture du tournesol en U.R.S.S. **[The cultivation of sunflower in U.S.S.R.]** *Rev. Bot. Appl.* 29, 1949 (227-234). [F.]

Sunflowers respond to applications in autumn of 15-20 tons/ha. of farmyard manure; or 60 kg./ha. of P_2O_5 as super., 45 kg./ha. of N as $(NH_4)_2SO_4$ and 45 kg./ha. of K_2O may be applied, $\frac{2}{3}$ in autumn and $\frac{1}{3}$ at flowering.

[1926] (47)634.953.6
ZON, R. **The Volga Valley Authority. The new fifteen-year conservation plan of the U.S.S.R.** *Unasylva* 3, 1949 (55-62). [U.S. Forest Service]

In this account of the 15-year conservation plan of the U.S.S.R. for reducing the threat of drought and increasing agricultural production, the following topics are discussed: creation of protection forest zones; establishment of forest shelter belts around croplands and orchards on collective farms; fixation and afforestation of shifting sands; crop rotation and water conservation.

[1927] (471)631.411.4
BRANDT, A. Über die Entwicklung der Moore im Küstengebiet von Süd-Pohjanmaa am Bottnischen Meerbusen. **[The development of the moors in the coastal area of South Pohjanmaa on the Gulf of Bothnia.]** *Ann. Bot. Vanamo* 23, No. 4, 1948, pp. 134. [G.fi.]

Coastal uplift has created a pattern in which young swampy moorland occurs along

the coastline with a connected series of moorland types inland, the age of whose members increases with altitude. 92 moors are vegetatively and stratigraphically investigated and their zonation is discussed.

[1928] (471)631.415.3
KIVINEN, E. Über Sulfatböden in Finnland. **[Sulphate soils in Finland.]** *Z. PflErnähr. Düng.* 45, 1949 (38-40). [G.]

A description is given of sulphate or "alum" soils in Finland which are distributed mainly in coastal areas. The content of soluble salts in the top soil varies from 0.5 to 2.5% (Al, Ca and Na sulphates and chlorides). A long-term field experiment showed good results with the application of lime (4-6000 kg./ha. in the first year and 2-4000 kg./ha. in subsequent years).—B.F.G.

[1929] (471)632.191 : 546.27
JAMALAINEN, E. A. Boorin puutteesta aiheutuvista kasvitaudeista ja boorin merkityksestä maamme kasvinviljelyssä. **[On boron deficiency diseases and on the role of boron in Finnish plant cultivation.]** *Valt. Maatalousk. Julk.* 130, 1949, pp. 48. [Fi.e.] [Agric. Res. Inst., Tikkurila, Finland]

B deficiency is common in Finnish acid soils. The usual practice of applying B fertilizers mixed with the seed affects germination adversely and gives uneven distribution of fertilizer in the field. For the control of dry rot in sugar beet that occurs in soils with pH 5-6, 10 kg./acre of boric acid or 15 kg. of borax should be applied with the fertilizer before sowing or with $Ca(NO_3)_2$ on the seedlings. For control of brown heart in swedes that occurs in various soils with pH below 7, the same quantity of B is recommended, but up to 30 kg./ha. of borax may be applied without injury. The disease is worst on peat and sandy soils. For control of internal cork of apples 100-200 g. of boric acid or 200-400 g. of borax, or larger doses, should be sprinkled around each tree. Wherever B supply was low, neither liming nor mineral fertilizers decreased the disease.

[1930] (495)631.4
ANASTASSIADES, P. A. **General features of the soils of Greece.** *Soil Sci.* 67, 1949 (347-362). [Athens]

The climate, soil parent material, vegetation and topography of Greece are described. The distribution of limestone, non-limestone and alluvial materials is mapped. Topography plays an outstanding role in the formation and development of the soils, as steep slopes predominate. Greek soils are low in humus which accumulates only in winter and then very slowly and this decomposes very quickly in the hot dry summer. Physical weathering prevails over chemical weathering. The formation of sand and silt fractions is much faster than that of clay, but in hot wet areas soils are light with relatively high content of clay. Exchange capacity is also generally low. There is not much leaching, and upward movement of salts predominates in many places. This results in the accumulation of salts in the upper soil and in alkaline soils of pH 7.5-8.0. This concentration of salts near the surface is important in flood-control projects. As a result of high Ca content in the parent material and inadequate leaching many soils tend to form pedocals which influence the movement of ground water. The loose structure of soil on steep slopes and torrential rain fall result in intensive erosion.

Greek soils are classified into mountainous soils with vertical zonation and soils of the Ionean, Aegean and northern belts. These 3 belts are divided into soils formed on (1) rocks poor in Ca, (2) hard limestone, (3) soft limestone. In all three belts, soils formed on (2) are terra rosa and those formed on (3) are rendzina. Ionian soils formed on (1) are Mediterranean forest soils with dominant lateritization, Aegean soils are dry Mediterranean forest soils with low lateritization and northern soils are grey forest and chestnut soils with low lateritization. The relationship of Greek soils to lateritic soils is discussed. Terra rosa and rendzina soils are discussed especially concerning the role of limestone in the formation of the former and of Ca in the fixation of organic matter in rendzina.

(5) ASIA

(*See also* Abs. No. 1819)

[1931] (51)633.18-1.5
TREWARTHA, G. T.; YANG, S. J. **Notes on rice growing in China.** *Ann. Assoc. Amer. Geog.* 38, 1948 (277-281). [Univ. Wis.]

In northern China there is a single rice harvest and in the south two successive rice crops are harvested during the year. Hainan Island produces 3 crops of rice a year in some places. On the margins of the Canton Delta two successive crops are grown by inter-cultural or inter-cropping methods using early- and late-maturing varieties in order to reduce the likelihood of injury from salty irrigation water in late summer and autumn.

[1932] (54)631.3
KHERDEKER, D. N. **Mechanization of Indian agriculture.** *J. Aust. Inst. Agric. Sci.* 15, 1949 (10-17).

[1933] (54)631.86/7 : 631.812
ACHARYA, C. N. **Manure production in villages.** *Indian Farm.* 10, 1949 (9-12). [Min. Agric., New Delhi]

Present methods of manure preparation in villages are subject to heavy losses of humus and N through leaching due to rain, and rapid drying by the sun. 200 million tons of cow dung are burned for fuel every year. Recommendations for manure production in villages are: sectional filling of trenches with cattle-shed and village refuse; planting fuel trees round villages or in special lots; preparation of manure from human excreta; preparation of compost from special types of refuse material such as water-hyacinth, sugarcane trash, forest litter and cotton stubble. Methods of preparation of composts are described.

[1934] (54)633.61-1.81
KHANNA, K. L.; SEHGAL, B. R.; BANDYOPADHYAY, K. S. **Crop surveys in Bihar. I. Studies in the estimation of acre-yield of sugarcane.** *Proc. Indian Acad. Sci.* 39B, 1949 (169-189). [Cent. Sugarcane Res. Sta., Pusa]

Cow dung was the most common manure used. Castor cake with or without farmyard manure was used on only a few fields. Castor cake gave higher yields than did farmyard manure. Non-waterlogged plots gave higher yields than water-logged plots except in a few types of soil in low-lying fields.

[1935] (541.4)631.67
INDIAN FARMING. **Hirakud dam project.** *Indian Farm.* 10, 1949 (38-40).

The Hirakud dam, the first of 3 dams to be constructed in the Mahanadi Valley in Orissa, will irrigate 1,094,953 acres of land.

[1936] (547)631.67
APTE, N. G. **The Bhima Valley.** *Indian Farm.* 10, 1949 (19-21). [Poona]

The topography, rainfall and cultivation of the Bhima valley which lies in Bombay Province at 4300-1100 feet are described. The rainfall is sufficient to supply water enough to produce food for 50 million people. 500,000 acres along the course of a main drain could be irrigated and 3,000,000 acres could produce crops. The soil in the upper part of the valley is light, about 6-9 inches deep, with a hard impervious substratum. Below 2000 feet, the soils are in many places 5-6 feet deep and absorb most of the rain that falls. Big dams and small bunds could be constructed in the first 400 miles of the river.

[1937] (547)631.841.1
IDNANI, M. A. **Use of sulphate of ammonia as fertilizer with special reference to Sind.** *Indian Farm.* 10, 1949 (13-15). [Agric. Res. Inst., New Delhi]

In Sind, bulky organic manures like compost applied alone increase wheat yields by 3% and cotton by 4%. Application of $(NH_4)_2SO_4$ gave increases of 26 and 38% respectively, and compost + $(NH_4)_2SO_4$ increased yields 32 and 36% respectively. The total N content of Indian soils is usually below 0.05% of which the greater part is in complex organic combination not easily available to crops. Sind soils contain large reserves of free lime and discriminate use of $(NH_4)_2SO_4$ would increase crop yields without making the soils acid. Slow deterioration of the soil can be checked by applying a basic dose of farmyard manure. Quality of seed obtained by using organic manures is better than when artificial fertilizers are used alone. Applications of $(NH_4)_2SO_4$ + compost are recommended.

[1938] (548.7)633.72-1.5
EDEN, T. **The work of the Agricultural Chemistry Department, Tea Research Institute of Ceylon, 1927-1948.** *Tea Res. Inst. Ceylon, Monog.* 1, 1949, pp. 78.

The use and interpretation of field experiments, the response of the tea crop to fertilizers, cultivation and weeds, soil structure and erosion, and composting and green manuring are discussed.

[1939] (549.4)631.67
BRETON, E. Les irrigations dans l'établissement français de Pondichéry. **[Irrigations in the French territory of Pondicherry.]** *Agron. Trop.* 4, 1949 (50-69). [F.]

A description of the irrigation network of Pondicherry with lists of irrigation works and areas covered.

[1940] (564.3)631.417
MCDONALD, J. **Organic matter content of Cyprus soils.** *Invest. Devel. Cyprus Agric. 1938-1948*, 1949 (10-11).

The humus of Cyprus soils adjusts itself to 1.0-1.5% in the non-irrigated arable plains privided an adequate level of nutrition is produced by fallowing or by the addition of organic manures or artificial fertilizers ; it is not economically practicable to raise the organic-matter content much above this level.

[1941] (595)633.74-1.5
HARTLEY, C. W. S. **Investigations into the growing of cocoa in Malaya.** *Malay. Agric. J.* 32, 1949 (59-69).

The establishment of cacao seedlings, shade trees and interplanting with other tree crops such as rubber are discussed.

(6) AFRICA

(*See also* Abs. No. 1786)

[1942] (62)631.81
NITRATE CORPORATION OF CHILE, EGYPT AND NEAR EAST. **Wheat, cotton, maize and the manuring of other crops in Egypt.** *Nitrate Corp. Chile, Cairo*, 1949, pp. 81.

Manuring of and field preparations and irrigation for wheat, cotton, maize, sugarcane, millet, barley, hemp, flax, jute, sisal, peanuts, oil plants, vegetables and fruit trees in Egypt are discussed based on experiments carried out during the last 20 years.

[1943] (62)633.51-1.81
BERTOLINI, M. El cultivo del algodón en Egipto. **[Cotton cultivation in Egypt.]** *Agric. Trop. Bogotá* 5, No. 5, 1949 (12-13). [Sp.]

The great improvement of soil water content from Nile floods is a main factor of cotton cultivation, but deposition of lime from this source plays only a small part. Native fertilizers, little changed since ancient times, comprise green manure from immature leguminous crops (especially clover) grown in rotation with cotton, raw brick dust mixed with manure, ashes of straw or of cotton plants, pigeon- or bat-guano, or garbage sweepings accumulated over two years. For some time chemical fertilizers have been used, especially kainite plus lime which benefits light soils, but not those of the delta. Two native earths with a long history as nitrogenous fertilizers in the upper Nile are 'marog' and 'tafla', the latter black in colour.

With regular applications of 300 kg. of $(NH_4)_2SO_4$, 500 kg. of 18% super. and 240 kg. of K_2SO_4/ha., production averages annually 370 kg. of clean fibre and 3.6 kg. of seeds, stalks and leaves. Sowing time is February-March.

[1944] (66/69)633.85
CHEVALIER, A. Plantes oléagineuses annuelles à cultiver dans les pays tropicaux et spécialement en Afrique noire. **[Annual oil plants cultivated in tropical countries, especially in Africa.]** *Rév. Int. Bot. Appl.* 29, 1949 (205-224). [F.]

The extension of cultivation for seed of mustard, brassicas, sesame, gourdes, melons, cucumbers, *Telfairia*, *Carthamus* and sunflower for oil production in tropical African countries is discussed.

[1945] (661/691)631.4(063)
PENDLETON, R. L. **African conference on soils at Goma, Belgian Congo.** *Soil Sci.* 67, 1949 (481-486). [John Hopkins Univ.]

The conference was the first representative international conference dealing with soils, soil conservation and land use for all Africa south of the Sahara and included Madagascar. It was resolved to set up regional committees of soil scientists in the principal regions and to develop a central pedological service under INÉAC at Yangambi. Travel

for soil scientists between various countries is desirable. An inter-African bureau of soil erosion and soil conservation is to be established with headquarters in Paris. A second African soil conference is to be held in 1953.

[1946] (666)631.473
LAPLANTE, A. C.; ROUGERIE, G. Étude et carte pédologique provisoire de la région littorale située à l'E de la côte d'Ivoire. [**A study and a provisional pedological map of the coastal region situated to the east of the Ivory Coast.**] *Rev. Bot. Appl.* 29, 1949 (24-33). [F.]

[1947] (669)634.9
KENNEDY, J. D. **The Jos plateau, its people and some aspects of forestry.** *Emp. Forestry Rev.* 28, 1949 (152-161).
Topography, climate, geology, soils, forest growth, denudation, erosion and irrigation are discussed.

[1948] (676.2/9)631.67
DUTHIE, D. W. **The Tana River irrigation scheme.** *E. Afric. Agric. J.* 14, 1949 (177-178).
The report on the Upper Tana River Irrigation Project, October 1948 is reviewed. The possibilities of irrigation from the Upper Tana River are unfavourable, owing to poor soil and excessive cost. The main soil types are (1) red sandy soils overlying kunkar at 1-5 feet below the surface and (2) dark grey clay loam which becomes a sticky paste when wet and cracks deeply when dry.

[1949] (678)633.491-1.5
GLOVER, J. **Environment and the growth of potato (*Solanum tuberosum*) in tropical East Africa.** *Emp. J. Expt. Agric.* 15, 1947 (6-26).
Kerr's Pink potatoes grown at 600 and 3000 feet altitude in Tanganyika Territory gave yields similar to English yields provided that the soils were manured on a scale comparable with moderate English practice and that the plants received enough water. The short day length and high temperatures were of no practical importance.

[1950] (68.01)631.4
SOUTH AFRICA DEPARTMENT OF AGRICULTURE. **Agro-economic survey of the Union. III. The Drakensberg grazing regions.** *S. Africa Dept. Agric. Bull.* 289, pp. 59.
Topography, soil, land utilization and crops are discussed.

[1951] (68.01)631.459 : 631.61
ROSS, J. C. **Land utilisation and soil conservation in the Union of South Africa. A review of progress to date and developments contemplated.** *Government Printer, Pretoria*, 1948, pp. 52.

[1952] (689.7)631.582
DUCKER, H. C. **Rotation crops.** *Emp. Cott. Grow. Corp. Rept. 1947-48*, 1949 (107-108).
Where land was cleared in the latter part of the rains and the grass buried in large ridges which were broken down when the plots were ridged for maize, yields of grain were increased by 1472 lb./acre over the normal practice of clearing elephant grass and burning it *in situ*. Groundnut yields were good on red soil previously planted to cotton; black soils gave poor yields, largely due to waterlogging. Sorghum treated as a perennial forms an admirable precursor to a grass resting ley. Mixed cropping of maize and cotton showed that maize benefited at the expense of cotton.

[1953] (691)633.854.56-1.5
ROUSSEAU, A. L'aleurite à Madagascar. [**The tung tree in Madagascar.**] *Potasse* 23, 1949 (87-89). [F.]

[1954] (691)633.91
BATHIE, H. P. DE LA Les plantes à caoutchouc de Madagascar. Valeur et possibilité de leur culture. [**Rubber plants of Madagascar. Their value and possibilities of their cultivation.**] *Rev. Bot. Appl.* 29, 1949 (17-20). [F.]
A number of indigenous plants are discussed.

[1955] (699.23)631.854
PICKUP, R. **Guano and phosphatic material from Ascension Island.** *Bull. Imp. Inst.* 46, 1948 (365-367).

Results of analyses of 9 samples are tabulated. 6 of the samples represent material likely to be of commercial value.

(7) NORTH AND CENTRAL AMERICA

(*See also* Abs. Nos. 1692, 1695, 1889)

[1956] (71)63
YOUNG, J. A. **Agriculture in Canada. 1. A general description. 2. Education research and government.** *Agriculture* 56, 1949 (23-31, 50-58).

Topics discussed include soils and climate, types of farming in different parts of Canada, intensity of farming and yields, Dominion and Provincial agricultural departments and their organization, research work being carried out on soils, crops and livestock, and farm advisory work.

[1957] (71)631.586
PALMER, A. E. **Recent developments of dry farming in Canada.** *Brit. Agric. Bull.* 1, 1949 (165-169). [Dom. Expt. Sta., Lethbridge, Alta.]

[1958] (712)633.11-1.4-1.81
ARCHIBALD, E. S. **The story of Canadian wheat.** *Canterbury Agric. Coll. N.Z. Second Hilgendorf Memorial Lecture.* 1949, pp. 40.

The soils of western Canada are divided into 4 major zones based on the relationship between soils and climate. The brown-soil zone covering 34 million acres of dry open prairie has a semi-arid climate; the dark brown-soil zone covering 30 million acres is moister; the black-soil zone with an area of 42 million acres lying between open prairie and forest is semi-humid. Wheat production is confined to these 3 zones where the soils developed under grass vegetation. The soils of the grey-wooded-soil zone are not so well adapted to wheat production. In the drier brown- and dark-brown-soil zones there is no benefit from growing grass or legumes in the rotation, and the standard rotations are summerfallow-wheat and summerfallow-wheat-wheat. In the black-soil zone the inclusion of grass and lucerne in the rotation has considerably increased the wheat yield. Very little livestock is kept in the wheat-growing areas and almost no manure is available. In the drier areas there is no response from the use of manure or fertilizers, but in the black-soil and grey-wooded-soil areas where forage crops can be grown, livestock is kept and manure is beneficial to wheat. In the more humid areas applications of 25-50 lb./acre of 11-48-0 fertilizer in the drill rows with the seed have given increases of 2-10 bushels/acre depending on the moisture conditions. Increases have been greater from fertilizers applied to wheat on summerfallow than to wheat on stubble. On grey-wooded soils there has been a remarkable response from the use of S or a combination of P and S, especially where legumes are included in the rotation.

[1959] (714)631.81
WRIGHT, L. E.; PELLETIER, J. R.; RIPLEY, P. O. **Manure, fertilizers and lime for field crops at Ste Anne de la Pocatière. P.Q.** *Sci. Agric.* 29, 1949 (128-136). [Exptl. Farms Serv., Ottawa]

A suitable combination of manure and fertilizers was sought in a 14-year experiment on podzol gravelly loam with a four-year rotation of turnips, oats, clover and timothy hay. For all four crops manure with ground limestone gave the highest yields, and manure alone the next highest. With turnips NPK proved highly effective in the first two years, but its efficiency declined later. Super. gave less spectacular increases, but maintained the improved yield. After a high but short-lived rise with NK fertilizer the yield fell almost to the level of the control. Precipitation influenced results considerably, high May rainfall being most beneficial. Oat crops gave more response to lime than did turnips, and unexpectedly NP and PK produced higher yields than NPK. Dry weather in May was found beneficial. Clover hay gave similar low yields to turnips in absence of P or manure and yields were highest after moderate to high rainfall in early summer. Timothy hay responded well to lime, but N and K produced little increase.

Soil reaction remained approximately neutral when lime was used every fourth year, but, without it, became strongly acid.

Depletion of soil P by cropping was considerable, and increased yields due to P fertilizers caused a rise in K depletion.

[1960] (72)631.459 : 631.61
OSORIO TAFALL, B. F. **Soil and water problems in Mexico.** *J. Soil Water Conserv.* 4, 1949 (59-66).

Many areas in Mexico are completely exhausted. The crumbling and fall of volcanic rocks, erosion and deforestation have destroyed agricultural and forest land, and poor agricultural practice has increased erosion. Reforestation and protection of fauna and flora and the establishment of Soil Conservation Districts are planned in the "Law of Soil and Water Conservation" published in the *Diario Oficial* of March, 1946. New forms of land use introduced include crop rotation, use of green manure, strip cropping, construction of drainage terraces and control of floods.

[1961] (728)633.61
MATZ, J. **Sugar cane in Central America.** *Foreign Agric.* 13, 1949 (157-159).

Yields, insect pests and diseases, insecticides and planting methods are discussed.

[1962] (728.6)633.491-1.81
CASSERES, E. H. Las papas—importancia del abono y variedades resistentes en su producción. **[The importance of manuring and of resistant varieties in potato cultivation in Costa Rica.]** *Publ. Téc. Interamer. Inst. Agric. Sci.* 27, 1948 (1). Hort. Abs. 19 (52).

On volcanic soils super. increased yield considerably, $(NH_4)_2SO_4$ was beneficial, but K had no effect.

[1963] (729.1)633.18-1.5
ARTEAGA Y ORTEGA, J. **Increase and improvement of the production of rice.** *Rev. Soc. Cubana Ing.* 44, 1947 (626-648). C.A. 43 (4803).

The chemical analysis of the soils of the principal rice-growing countries in the Far East and U.S.A. are compared with Cuban soils suitable for rice growing. Excess of N enhances the growth of stem and leaves, gives a dark green colour and increases weed growth. Excess of K produces turgid grains which break easily; **K** should be applied as sulphate or chloride. The cultivation of rice in Cuba is discussed.

[1964] (729.4)631.445.73
GOLDICH, S. S.; BERGQUIST, H. R. **Aluminous lateritic soil of the Republic of Haiti, West Indies.** *U.S. Geol. Surv. Bull.* 954C, 1948 (63-109). C.A. 43 (4799).

Aluminous lateritic soil is a term used for surface material composed predominantly of hydrous oxides of Al mixed with oxides of Fe, Ti and Mn, and containing as much as 50% of Al_2O_3. It is finely divided and brown to buff in colour. Its average chemical composition is: Al_2O_3 46.8%, SiO_2 3.4%, TiO_2 2.8%, Fe_2O_3 21.9%, P_2O_5 0.6% and MnO_2 0.5%. Its parent material is probably igneous.

[1965] (73)633.71-1.81
MEHRING, A. L. **Consumption and composition of tobacco fertilizers.** *Agron. J.* 41, 1949 (240-246).

Tobacco culture consumed 5.8% of all commercial fertilizers sold in the U.S., although tobacco was grown on only 0.2% of the crop and pasture land. This percentage of the total consumption has remained practically constant during the last 40 years, but the average amount of fertilizer applied has increased during that time from 65 to 240 lb./acre of plant food made up of 45 lb. of N, 115 lb. of P_2O_5 and 80 lb. of K_2O. Over 95% of all tobacco grown in the U.S. now gets fertilizer. The present trend is towards a lower proportion of P in mixed fertilizers and higher analysis grades. About half the K used is in non-chloride forms. One ton of fertilizer gives an average increase of half a ton of tobacco.

[1966] (75)633.51-1.81 : 581.192
THARP, W. H.; SKINNER, J. J.; TURNER, J. H. ET AL. **Yield and composition of cottonseed as influenced by fertilization and other environmental factors.** *U.S.D.A. Tech. Bull.* 974, 1949, pp. 153.

Availability and balance of specific elements had marked influence on the percentage composition of cottonseed. Increase of N effected a rise in protein content and a slight reduction in oil content, the grade being unaffected. Addition of P produced no outstanding results, but in P-deficient soils some variability was recorded. Increase of K caused considerable rise in oil percentage with but slight fall in protein, thus raising both total reserve capacity and grade.

One exception occurred where both yield and percentage reserve were reduced. In some respects not readily definable, N, P, and K appeared to interact, and highest yields were given by an optimum balance of available nutrients. Na apparently had similar action to K but tests were not extensive. Ca and Mg had little direct effect on composition but probably operated through induced pH changes in soil acting on availability of other elements. Natural manures increased total percentage reserve capacity but separate effects on oil and protein depended on moisture supply and other factors.

[1967] (77)631.47
VISHER, S. S. **Regionalization of Indiana.** *Ann. Assoc. Amer. Geog.* 38, 1948 (282-300). [Indiana Univ.]

Topographic, soil, climatic and agricultural regions, productivity and land values and drainage systems are discussed.

(8) SOUTH AMERICA

(*See also* Abs. No. 1700)

[1968] (82)633.18-1.5
RIZZUTO, F. A. **[Rice cultivation in Argentina.]** *Risicoltura* 37, 1949 (16-18). B.A. BIII, 1949 (186).

[1969] (86)631.459 : 631.61
FRANCO, R. M. Campaña de defensa y restauración de los suelos en las regiones cafeteras. **[Campaign for soil protection and restoration in coffee-growing areas.]** *Agric. Trop. Bogotá* 5, No. 5, 1949 (39-43). [Sp.]

Soil erosion is acute in Colombia where the slopes render the soil particularly vulnerable in winter. Coffee cultivation has assisted soil conservation, as it is a permanent crop, protected by shade trees. Experimental work on soil conservation began with a detailed survey of the coffee areas, including studies of conditions under local growers, who were induced to co-operate with experts in introducing improved equipment and methods, including drainage works, terracing, contour cultivation and shade tree maintenance, while making the best use of natural features. Some 10,000 ha. of coffee land have thus been improved and neighbouring swamps drained and planted with suitable crops.

[1970] (86)633.491-1.5
YEPES, E.; MOLINA, L. El cultivo de la papa en Antioquia. **[Potato cultivation in Antioquia.]** *Agric. Trop. Bogotá* 5, No. 6, 1949 (9-14). [Sp.]

Production figures, costs, acreage, etc., are given, also local variations in planting, and results of fertilizer experiments.

[1971] (86)633.73-1.81
GONZÁLEZ, A. C. Abonamiento racional café. **[Rational fertilizing of coffee.]** *Agric. Trop. Bogotá* 5, No. 6, 1949 (23-29). [Sp.] [Servicio Técnico Agronómico de los Nitratos de Chile]

Fertilizers are used in all coffee-growing regions of South America, the chief being Chile nitrate, KCl, K_2SO_4, super. and bone-meal. Chile nitrate is very suitable for the acid soils of Colombia.

(9) OCEANIA

(*See also* Abs. No. 1640)

[1972] (92)631.4
BAREN, F. A. VAN Wetenschappelijke, practische en sociale aspecten van het bodemkundig onderzoek in Indonesie. **[Scientific, practical and social aspects of studies in soil science in Indonesia.]** *Landbouw* 20, 1948 (195-209). [Du.] [Alg. Proefsta. Landb., Buitenzorg]

In a systematic survey for soil-mapping purposes, especially in a country where erosion plays an important part, cultivated soil layers bearing no genetical relation to the subsoil are often concerned. Strictly speaking these can be regarded as residual soil profiles, i.e., as gradual transitions from the parent rock to the upper layer forming the agricultural soil. The existence of podzols at low altitudes in Banka, Borneo and New Guinea provides an example of a discrepancy between the occurrence of a given soil type and prevailing climatic conditions. A problem is presented by the "bleekaarden", white soils derived from quartz-rich parent material. Detailed laboratory studies are required to elucidate the conditions underlying the formation of this soil type ; it may be a process of ground-water podzolization.

The irreversible fixation of fertilizer K by the finer soil components requires investigation as under certain conditions a large

part of the capital invested in K manuring is lost in low yields. This has occurred in the tobacco soils of Merapi. Other practical problems are concerned with the reaction of different soil types to fertilizers and with fertilizer supply. Coconut-shell ash and molasses were studied as wartime sources of K, but high-grade commercial fertilizers give higher yields for the outlay involved. The results of research on K minerals that was begun by a Japanese mining bureau are unknown.

[1973] (92)631.459
DIJK, J. W. VAN; EHRENCRON, V. R. R. **The different rate of erosion within two adjacent basins in Java.** *Meded. Alg. Proefsta. Landbouw* 84, 1949, pp. 10. [E.]

Stream run-off was measured thrice daily from two basins, one with steep slopes formed of volcanic deposits and one formed of marly sediments. Erosion from the marly region was considerably greater than from the volcanic area. The vegetation of the volcanic area was chiefly mixed forest with narrow strips of irrigated rice fields along the river and small areas of unirrigated arable land. The marly area was chiefly teak forest with similar cultivation to that in the volcanic basin.

[1974] (92)631.459 : 631.61
SCHUITEMAKER, B. Maatregelen tot het behoud van de bodem in het inheemse landbouwbedrijf op Java. **[Indonesian measures for soil conservation in Java.]** *Landbouw* 21, 1949 (153-176). [Du.e.]

A survey was undertaken in 1941 of the conservation practices employed in 5 regions of extensive and 5 regions of intensive farming in Java. The recommendations for regions of extensive farming, in which a fallow is often included, are to plant *Leucaena glauca* in contour to promote the formation of natural terraces. Other measures practised are: piling up weeds or stalks of manioc or maize on the contour, leaving the weeds intact on the contours, marking the contours by shovelling earth uphill, constructing slightly sloping drains to prevent run-off losses, and hoeing the steeper plots.

In the intensive regions the measures are: manuring with dung, compost and green manure, construction of terraces, protecting the terrace walls with stones or firmly rooting hedges, or soil stabilizing with grasses.

In one district ridges are built up along the contours and the water conducted through furrows following the slope of the land and fortified at regular intervals with stone piles to prevent gulley formation. This system is suited to the loose volcanic soils where the water seeps in easily. A few particulars of land use and ownership in the districts are given.—K.S.

[1975] (931)63.
HOPPER, W. C. **New Zealand's agriculture.** *Agric. Inst. Rev.* 4, 1949 (235-246).

Agricultural production, soils, climate, erosion and possible expansion of production are discussed.

[1976] (942)631.67
McINTOSH, M. **The River Murray barrages.** *J. Dept. Agric. S. Aust.* 52, 1949 (425-429).

[1977] (943)631.445.53 : 631.415.7
SKERMAN, P. J. **The use of vegetation in locating solonetz soils in Queensland.** *Queensland J. Agric. Sci.* 5, 1948 (17-22). [Dept. Public Lands]

The presence of fairly dense "sandalwood" (*Eremophila mitchelli*) usually indicates areas of poor drainage unsuited to irrigation. The soils are 6-12 inches of very fine sandy loam overlying 1-3 inches of bleached fine sandy loam, somewhat cemented, and then an impermeable mottled clay horizon. The loam is often powdery and blows easily in dry weather leaving bare clay pans; the bleached subsoil is also brought to the surface by the passage of cattle when the soil is waterlogged. The impermeability of the clay is due to a high percentage of Na in the exchangeable cations; "sandalwood" can grow where the soil Na exceeds 10%.

Areas where bull oak (*Casuarina leuhmanni*) are dominant are almost useless as grazing lands. The soils are grey-brown sandy loam overlying bleached sandy loam at 3-4 inches. Below this lies mottled clay which is soapy when wet. The Ca in the subsoil has been replaced by Na.

[1978] (943)631.671

KING, N. J. **Irrigation waters of the Bundaberg area.** *Queensland J. Agric. Sci.* 5, 1948 (23-38). [Bur. Sugar Expt. Sta.]

Underground irrigation-water supplies are divided into 3 classes based on the overlying geological formations. Topography and soils are described and the composition of waters from each of the 3 areas is compared.

[1979] (945)633.2.03-1.67-1.81

MORGAN, A. **Irrigated pastures in Victoria. 2.** *J. Dept. Agric. Victoria* 47, 1949 (199-207).

Fortnightly watering gave the highest and best sustained production; with an average absorption of 1.61 inches per watering the total water applied each year was approximately 2 acre feet. Under every water treatment tried, super. alone was the most efficient manurial treatment. Combinations of other fertilizers with super. depressed production. 4 cwt./acre of super. gave the highest yields in the areas watered fortnightly. There seems to be no advantage in splitting the annual application. Botanical composition was altered by irrigation and super. treatments. The grass-clover balance became good; clovers increased to 51.6% and perennial clovers developed at the expense of annual clovers. Perennial ryegrass increased to 10% and weed content was reduced to ½%. It is impossible to irrigate at short intervals heavy irrigations at longer intervals compensate to some degree except on heavy soils.

RECENT BOOKS

631.3 KURATORIUM FÜR TECHNIK IN DER LANDWIRTSCHAFT.
Berichte über Landtechnik. III. Schlepper und Arbeitsgerät. [Reports on agricultural Technique. III. Tractors and Implements.] Verlag Helmut Neureuter, Wolfratshausen/Munich. 1948. Pp. 172.

631.4 : 631.81 LOWE, L. T.
Students Handbook to Fertilizers and Soils. Littlebury & Co. Ltd., Worcester, England. 1949. Pp. 111. 8s. 6d.

631.411.4 : 631.5 BRÜNE, F.
Die Praxis der Moor- und Heidekultur. [The Practice of Fen and Heath Cultivation.] Paul Parey, Berlin. 1948. Pp. 258. 12 M.

631.811 : 631.4 MITSCHERLICH, E. A.
Pflanzenphysiologische Bodenkunde. [Plant-physiological Soil Science.] Akademie-Verlag. Berlin. 1948[?] Pp. 56. 2 M.

633-1.5 FERGUS, E. N.; HAMMONDS, C.
Field Crop Management. J. B. Lippincott & Co., Philadelphia and London. 1949. Pp. 600. 18s. od.

(75/6)633-1.5 FERGUS, E. N.; HAMMONDS, C.; ROGERS, H.
Southern Fields Crops Management. J. B. Lippincott & Co., Philadelphia and London. 1949. Pp. 725. 18s. od.

INDEX TO AUTHORS

SOILS AND FERTILIZERS

Vol. XII 1949 No. 6

THE FOURTH INTERNATIONAL CONGRESS OF SOIL SCIENCE

The Fourth International Congress of Soil Science will be held in Amsterdam, Holland, from July 24 to August 1, 1950, under the auspices of the Netherlands Society of Soil Science. The Secretary of the Organizing Committee is Dr. P. A. Rowaan, 3 van Hallstraat, Groningen, Holland, to whom enquiries relating to the Congress should be addressed.

A chief aim of the Congress, according to the organizers, will be to renew the international relations between soil scientists that were broken up by the war. It is also hoped to consider and if possible to establish, the foundation of a new International Society of Soil Science.

The Congress membership fee will be 15 U.S. dollars or its equivalent in Dutch currency, and 4 dollars or its equivalent for an accompanying relative.* The full membership fee entitles a member to attend all the sessions and excursions during the Congress (but not the post-Congress excursion) and to receive a copy of the Congress transactions.

After the Congress a ten-day excursion is planned, from August 2 to August 12, to visit the island of Walcheren, the greenhouse centre of the Westland, the fruit area on the river clay, the Zuiderzee works, and reclamation projects of peat soils and the new sea-clay soils on the northern coast. This will be followed by a six-day (August 13-19) tour of Belgium during which the three Belgian centres of soil research, Louvain, Ghent and Gembloux, will be visited. The cost of the excursions has been provisionally estimated at 100 U.S. dollars for the Dutch, and 70 dollars for the Belgian part.*

Honorary Presidents of the Congress include Dr. D. J. Hissink, Sir E. J. Russell, Dr. W. P. Kelley and Dr. A. Demolon. Many well known soil scientists have agreed to serve as Vice-Presidents.

The work of the Congress will be done in Sections of Soil Physics (Chairman: Dr. Y. Gustafsson); Clay Minerals; Soil Chemistry (Chairman: Dr. S. Hénin); Soil Biology (Chairman: Professor A. G. Norman); Soil Fertility (Chairman: Dr. E. M. Crowther); Tropical and Sub-tropical Soils (Chairman: Professor F. Hardy); Soil Conservation and Management (Chairman: Mr. J. P. Harroy); Land Classification and Evaluation; and Saline Soils (Chairman: Dr. J. K. Basu).

It is hoped to publish the majority of the papers to be read before the Congress takes place, and in order to ensure pre-Congress publication intending members are invited to send contributions (which should be written in English, French or German with a summary in English, and not exceed 1000 words in length) to the Organizing Secretary before December 1, 1949. Papers will only be accepted if they deal with one of the following subjects which will be discussed by the respective sections.

Soil Physics. Soil structure: evaluation of structure; genesis of structure; organic matter and structure; structure and crops; structure and erosion. Soil moisture: determination; movement in unsaturated soils; moisture and crops.

Clay Minerals. Genesis and synthesis; interstratified minerals; differential thermal analysis; crystal structure and ion exchange; hydration in relation to crystal structure.

Soil Chemistry. Role of mineralogy in soil science. Determination of exchange capacity and exchangeable ions. Formation and

* These charges were fixed before the recent devaluation of the Dutch and other currencies in terms of the dollar.

properties, identification and determination of soil organic matter, humus, manures, composts, etc. Green manures.

Soil Biology. Microbiology: transformation of organic carbon, nitrogen and phosphorus compounds by micro-organisms; transformation of inorganic compounds (including nitrogen fixation); rhizosphere activity; influence of micro-organisms on soil structure; the fate of insecticides, herbicides, etc. in the soil. Macrobiology: influence of soil fauna on organic matter, soil structure and fertility; sampling methods.

Soil Fertility. Chemical and biological methods of soil analysis; radio-tracer methods; visual symptoms of nutrient deficiencies; plant analysis; field experiments. Factors influencing nutrient uptake. Maintenance and improvement of fertility.

Tropical and Sub-tropical Soils. Lateritic soils; tropical black earths; tropical podzols; sub-tropical soils.

Soil Conservation and Management. The rainfall factor in soil erosion; value of run-off experiments; determination of erodibility; aerial surveying for erosion control; conservation of peaty soils; the origin of changing climates with regard to wind erosion; fire as a factor in soil deterioration; social aspects of soil deterioration; shifting cultivation.

Land Classification and Evaluation. Use of soil science in classifying land: soil conservation; soil amelioration, rent and selling value; land-use planning. Methods of research: natural vegetation as indicator of land quality; soil characteristics; management costs. Criteria for classifying land: productivity ratings; use capabilities; capabilities for amelioration; economic value.

Saline Soils. Genesis; management and reclamation; chemical problems and methods of analysis; mapping; reclamation of soils inundated by sea water.

Other Subjects. Facilities will be provided for members interested in subjects unavoidably omitted from the above list to hold informal discussions on them.

The Organizing Committee announced in September that nearly 300 applications for membership of the Congress had already been received. Registration forms will be ready for distribution early in 1950.

SUMMARY OF REPORTS

Reports received include: *Bermuda*, Report of Department of Agriculture 1948; *British Guiana*, Field Experiments with Sugar Cane and Report of Sugar Experiment Stations 1948; *Canada*, National Research Council Report 1948-49; Province of British Columbia Department of Agriculture Report 1948; Province of British Columbia Report of Forest Service 1948; Province of Nova Scotia Report of Department of Agriculture and Marketing 1947-48; Ontario Research Foundation Report 1948; Dominion Experiment Stations Progress Reports, Beaverlodge, Alberta 1937-47; Normandin, Quebec 1936-46; Swift Current, Sask. 1937-47; *Ceylon*, Report of Director of Agriculture 1947; *Colombia*, Palmira Agricultural Experiment Station Report 1948-49 [in *Notas Agronomicas* 2, 1949 (57-69)]; *Colonial Office* Annual Reports 1948 for Brunei, Gambia, Gibraltar, Somaliland; *Cyprus* Department of Agriculture Report 1948; *Empire Cotton Growing Corporation* Report 1947-48; *Holland*, Verslag van het Centraal Instituut voor Landbouwkundig Onderzoek 1948; Verslag van het Landbouwproefstation en Bodemkundig Instituut T.N.O. 1948; *Hongkong*, Report of Senior Agricultural Officer 1947-48; *India*, Report of Indian Council of Agricultural Research 1947-48; *Isle of Man*, Report of Board of Agriculture and Fisheries 1947-48; *Mauritius* Department of Agriculture, Report of Sugarcane Research Station 1948; *New Zealand* Department of Agriculture Report 1948-49; *Nyasaland*, Report of Department of Agriculture 1947; *Northern Rhodesia* Water Development and Irrigation Department Report 1948; *Sierra Leone*, Report of Department of Agriculture 1947; *Singapore*, Report of Department of Agriculture 1948; Botanic

Gardens Report 1948; *South Africa* Wattle Research Institute, University of Natal, Report 1948; *Stratford-on-Avon* Grassland Improvement Station, Experiments in Progress 1949; *Swaziland* Livestock and Agricultural Department Report 1947; *Switzerland*, Annuaire Agricole de la Suisse Département Fédéral de l'Economie Publique 1949; Eidgenossische Agrikulturchemische Anstalt, Liebefeld-Bern, Reports 1947 and 1948 [in *Landw. Jahrb. Schweiz* 63, 1949 (299-320)]; *Trinidad*, Imperial College of Tropical Agriculture Report 1948; *Uganda*, Report of Department of Agriculture 1947; *West Virginia*, Report of Inspection Work, Commercial Fertilizers and Limes, Department of Agriculture, 1947; *West African* Cacao Research Institute, Tafo, Quarterly Report, January-March, 1949; *United States Department of Agriculture*, Report on Agricultural Experiment Stations 1948; *United States Experiment Station* Reports, *Florida* 1947-48; *Iowa* 1947-48, Project Reports and Iowa Corn Research Institute Report; *Michigan* 1947-48; *Mississippi* 1947-48; *New Jersey* 1947-48; *New Mexico* 1946-47 and 1947-48; *Oregon* 1948; *Rhode Island* 1948-49; *Wisconsin* 1946-47.

British Guiana.—Effect of P manures in combination with liming material and $(NH_4)_2SO_4$.

Canada.—*British Columbia Department of Agriculture.*—Report on soil classification for irrigation proposals and land utilization. Correlation between soil formation and natural vegetation; plants as soil indicators. Use of mulching materials for fruit trees and strawberries. Fertilizer experiments for pastures and potatoes.

Nova Scotia Department of Agriculture.—Reclamation of marshlands. Comparison of value of granulated blast-furnace slag with ground limestone. Cobalt-deficiency studies.

Dominion Experimental Station, Beaverlodge, Alberta.—Light applications of ammonium phosphate for cereals. Fertilizer application to meadows not profitable; carry-over effect of fertilizers usually slight, but barnyard manure is effective for several years. Fertilizers for intertilled crops, flax and legumes. Methods of fertilizer application to potatoes. Green manuring on grey wooded soils is often wasteful. Forage crops essential in erosion control on fine silty soils. Time of application of sodium chlorate as weed killer; Sinox for flax and peas. List of weeds and crops susceptible to 2,4-D.

Dominion Experimental Station, Normandin, Que.—Fertilizers for pastures. Green manuring and fertilizers for barley and potatoes. Comparison of manure alone, manure+chemical fertilizers, and chemical fertilizers alone on light soil with rotation of potatoes and turnips, barley and clover. Effect of different rates of ground limestone on cereals and succeeding hay crops. Control of brown wart of turnips with borax.

Dominion Experimental Station, Swift Current, Sask.—Effect of depth of moist soil at seeding time on wheat yields. Fertilizers for wheat. Reclamation of badly drifted areas. Development of tillage machinery.

Ceylon.—Cultivation and fertilizers for tea, coconuts, maize, paddy and tobacco. Soil reconnaissance surveys. Assessment of relationship between the amount and the stability of crumbs. Changes in crumb structure as result of *chena* cultivation. Rate of movement of salts in Ceylon soils. Rate of percolation of water in saline calcareous soils and the action of S and gypsum on these soils. Utilization of raw bones as fertilizers.

Colombia.—Nutrient requirements of sugar cane, beans, maize and rice in various soils. Composting yuca.

Empire Cotton Growing Corporation.—Fertilizer and spacing trials in Uganda. Work on tie ridging and grass leys in Tanganyika. Maintenance of soil fertility by rotations, grass leys and mixed cropping in Nyasaland. Cotton in mixed farming in Southern Rhodesia. Fertilizer trials in Nigeria. Rotation and land-use investigations in West Indies; weed-fallow rotations with cotton compared with catch crops of green manure, particularly elephant grass.

Holland.—*Instituut voor Landbouwkundig Onderzoek.*—Effect of weather, soils, moisture and treatment on the composition of pasture plants and grass in orchards. Improvement

of grassland fen soils and river-clay grassland; influence of N and manure on productivity. Earthworm and wireworm population of soils. Fertilizers for grains, peas, potatoes and flax. Influence of fertilizers, irrigation and soil type on the feeding quality of potatoes.

Landbouwproefstation en Bodemkundig Instituut T.N.O.—P fertilizers for grassland on various soil types. Experiments with K on grassland on clay, marine-clay and fen soils. Trials with Cu on grassland and Mg on potatoes. P fixation in soils and mobilization of P by green manure. P fertilizers for soils with strong P-fixing quality. Need of grasses and clover for Mn; damage to crops by overdoses of Mn. Use of certain crops as indicators of soil fertility. Effect on grassland of combinations of N, P, K, Ca, Mg and organic manures. Uptake of K in relation to Ca-Mg ratio and base saturation. Replacement of K by Na in beet cultivation. Connexion between thickness of the clay layer and depth of the furrow and P and K uptake. Stable aggregates and soil fertility. Effect of compost, stable manure and ploughing-under of straw on soil fertility. Relationship of soil structure, fertility and water-holding capacity. X-ray investigation of clay minerals. Causes of drying in fen and fen-clay soils and how to combat it. Problems of raising water table of streams by increasing tension and of raising ground-water level by infiltration.

Hongkong.—Use of nightsoil for rice and vegetable growing.

Indian Council of Agricultural Research.—Colloidal constituents of Indian soils. Minor elements and remedies for deficiencies. Rice: effects of irrigation treatments; comparison of green manuring, fallowing, green manure with bonemeal, and castor cake with N.

Mauritius.—Effect of fertilizers on sugar content of cane. Fertilizer value of crushed basaltic rock. Trials with scums, molasses, ashes and guano phosphate as fertilizers. Tests on the effect of Mg, K, Zn, Cu, Mn and B on yield and sucrose content of cane. Cultural and fertilizer trials with linseed, sorghum and soybeans.

New Zealand.—Trials with heavy dressings of lime, P and K on poor pastures and peat; regulation of water table and drainage control on peat. Top dressings for pastures. Earthworms in relation to agriculture.

Nyasaland.—Cultural and manurial experiments on tung trees. Spacing, cultivation and manurial trials on tea; time of application of fertilizers for tea. Experiments with organic manures and mulching for maintenance of soil fertility.

Sierra Leone.—Improvement and spread of rice cultivation on reclaimed mangrove swamps. Saline-swamp reclamation and inland-swamp cultivation with cassava, sweet potatoes and vegetables. Mechanical cultivation of swamps. Investigations on drainage of whole farms for removal of soil toxicity due to Fe. Irrigation schemes. Cultivation on poor upland soils using contour ridging, grass planting and establishment of permanent fruit trees with composts and fertilizers. Effect of compost and fertilizers on rice, *Pueraria* and *Panicum laxum*.

Singapore.—*Department of Agriculture.*—Manuring of vegetables with pig manure; composting of manure. Prawndust, soya-bean cake and farmyard manure for tobacco.

South African Wattle Research Institute.—Use of super. on wattle to increase resistance to frost. Effect of clean cultivation of wattle in reducing frost damage. Trials to find economic balanced fertilizer for wattle. Comparison of super., metaphosphate and rock phosphate, and studies on P assimilation.

Swaziland.—Fertilizer and rotation experiments with maize and cotton. Composts for maize. Soil-restoration experiment. Cotton and groundnuts as witchweed-immune rotation crops for cereals.

Switzerland.—*Eidgenossische Agrikulturchemische Anstalt.*—P fertilizers for alpine pastures. Fertilizers for sugar beet; Mn and increase of N. Effect of soil moisture on sugar content of beet. Cultivation vs. ploughing after row crops.

Trinidad.—*Imperial College of Tropical Agriculture.*—Laboratory investigations on rock weathering and soil formation from British Guiana and Barbados clays and from volcanic rocks of the Antilles. Investigations of fundamental biochemical soil processes involving C and N.

Uganda.—Improvements in eroded areas after application of cattle manure. Small progress in resting and strip cropping. Mulching of plantain gardens. Mechanical cultivation.

West African Cacao Research Institute.—Applications of N, K and NK depressed growth; P stimulated growth. Method of applying super. Soil-moisture determinations; NPK treatment slightly increased water-holding capacity. Methods of soil-surface protection.

United States Department of Agriculture.—*Report on Agricultural Experiment Stations.*—Radioactive elements in soil research; use of radioactive Ca for determination of how lime benefits plant growth on acid soils. Deficiency and toxicity of minor elements in different soil conditions. Manure and straw mulch for apple trees. Injury to apricots connected with boron. NaCl for increasing sugar-beet yields. Soil fumigation against root knot. Linings for irrigation canals.

Agricultural Experiment Stations.—*Florida.*—Rotation studies with maize, cotton, crotalaria and winter legumes. Fertilizers for maize, pastures, tobacco, tung, citrus and vegetables. Effect of minor-element fertilizers on oats, clovers and grass. Effects of mulches on root-knot nematodes. Soil acidity and growth of vegetables. Relationship of Zn, B and Mg to growth and reproduction of pecans. Effect of soil fumigants on yield and quality of vegetables. Influence of green manure on damping-off of vegetable seedlings. Availability of P from various fertilizers applied to different soil types. Retention and utilization of B in Florida soils. Liquid fertilizers for vegetables. Soil-moisture requirements of citrus. Survey of Mo in soils of Everglades. Subsidence of peat soils.

Iowa.—Forms of P in soils and their availability to plants; P fixation by kaolinite; effect of temperature on mineralization of soil organic P; extraction of organic P from soils. K availability in different soil types and crop responses to K fertilizers. Influence on soil properties of mineralogical nature of clays. Crop rotations for clay-pan soils. Crop sequence and fertilizers for soybean production. Liming, fertilizers, rotations and soil treatments on slowly-draining Prairie soils. Control of potato scab in highly calcareous peat and muck soils. Fruit-growing on loess hill soils.

Mississippi.—Anhydrous ammonia for cereals. Tests with radium and other radioactive elements as fertilizers for maize, cotton and lespedeza. Experiments on effect of soil compaction on cotton yields.

New Jersey.—Use of gypsum for improving drainage of wet soils. Lime and fertilizers for improving subsoils. Restoration of Mg and Mn deficiencies. Ratio of available Fe to available Mn. Detrimental effect of DDT on plants growing in treated soil. Effect of hydrated lime on chicken litter. Effect of P nutrition on susceptibility of tomato to B deficiency and toxicity. Effect of low Mg on accumulation of sugar in tomato. Methods of applying fertilizers to potatoes. Wire-worm control in potatoes. Deficiency of B and Ca in strawberries. Accumulation of salts in greenhouse soils. Leaching of greenhouse soils using sub-irrigation methods. Corrosion of steel and iron in soil by bacteria. Use of lime-treated tomato-canning wastes as fertilizers.

New Mexico.—Mulches for cotton on flood- and furrow-irrigated land; irrigation frequencies for cotton; light irrigation more efficient than heavy. Effect of lucerne, clover, irrigated pasture and maize on the structure of and nitrate accumulation in heavy clay soil. Growth of lucerne on high-water-table soil. 2,4-D for bindweed eradication.

Oregon.—Irrigation and fertilizers for hops. Eradication of gorse with 2,4-D, sheep grazing and fertilizing of pastures. Wood and sawdust mulches for horticultural crops and potatoes. Tillage and soil fumigants for centipedes on beans. Applications of S to

lucerne increased carotene content. Slick spots caused by high Na content made productive by applying manure and lime or manure and gypsum.

Rhode Island.—Comparison of effect of nitrate and sulphate N and of muriate and sulphate of K on yields and composition of clover-grass plots. Straw, sawdust and wood-chip mulches for apple trees and strawberries; effect on soil temperature.

Wisconsin.—High K fertilizers and lime for sandy soils. Use of flame photometer for measuring exchangeable K and Na in soils. Use of buried gypsum blocks to determine moisture conditions of soils below the surface. Harmful effect of Mn on potatoes. Improvement of food value and yield of peas by Mg. Time of application of 2,4-D to maize.

CATION EXCHANGE

(*Cation Exchange in Soils. By Walter P. Kelley. Reinhold Publishing Co., New York.* 1948. *Pp. xiii*+144.)

Those who know the outstanding contribution which Dr. W. P. Kelley has made to the study of cation exchange in soils will welcome the opportunity of reading his account of the subject. The author brings his ripe experience to bear on many troublesome questions, and he is commendably frank when he feels unable to give a definite answer. If this book has a weak spot it is probably in the treatment of soil acidity. The author is perhaps a little too satisfied with the idea of "exchangeable hydrogen", and has given too little consideration to the rôle of aluminium ions.

Dr. Kelley gives the reader the benefit of his long experience in the determination of exchangeable cations and of the cation-exchange capacity. His chapter on the identification and estimation of clay minerals effectively summarizes the present position. A valiant attempt is made in the chapter on principles of cation exchange to present the theories and equations that have been proposed. The opening chapter on the history of cation exchange is particularly interesting.

Though scarcely a monumental work, the book will be a welcome addition to many bookshelves.

R. K. SCHOFIELD

ABSTRACT SECTION

NOTE.—A capital letter in square brackets following the reference denotes the language in which the paper is written. A small letter denotes a summary in another language, e.g. [G.e.]—German, with English summary. English [E.] is only indicated for papers published in journals usually written in foreign languages. Where the Bureau has only seen an abstract, and not the original paper, no language indication is given.

Original (untranslated) titles of papers are only given where the Latin script is used.

Where more than one reference is given, the first is to the original paper, the others to notices in abstract journals. A key to the abbreviations used in the references is contained in the Bureau's *Bibliography of Soil Science, Fertilizers and General Agronomy.*

63 : 551 5 METEOROLOGY

[1980] 63 : 551.5
GLOYNE, R. W. **Meteorology and agriculture—some practical problems.** *Quart. J. Roy. Met. Soc.* 75, 1949 (309-323). [Met. Office]

Problems in the use of fumigation, aerosols, dusting and spraying are reviewed from the meteorological standpoint. The value of weather forecasting in anticipating outbreaks of potato blight and of meteorological records in planning suitable methods of haymaking and harvesting for different districts is pointed out. The effects of air temperature on clamp-stored root crops is discussed.

[1981] 63 : 551.5
GODARD, M. Microclimats et mésoclimats du point de vue agronomique. **[Microclimates and mesoclimates from the agricultural standpoint.]** *Ann. Agron.* 19, 1949 (578-604). [F.] [Sta. Bioclim. Agric., Montpellier]

631.3 AGRICULTURAL EQUIPMENT

(*See also* Abs. Nos. 2249, 2256)

[1982] 631.3
HARDY, E. A. **Mechanization for farming.** *Agric. Inst. Rev.* 4, 1949 (279-284). [Univ. Sask., Saskatoon]

Machinery for drainage, irrigation, tillage, seeding and planting, weed control, harvesting and for mixed farming is discussed.

[1983] 631.312 : 631.875
RANDELL, J. F. **Attachment for ploughing in straw manure.** *N.Z. J. Agric.* 78, 1949 (582). [Dept. Agric., Christchurch]

The attachment consisting of a 6-foot length of tool bar, a deer-tongue standard and a duck-foot cultivator is attached to a plough. The standard is set so that when the plough is tripped and operating it penetrates the soil to a depth of 2 inches in line with the next furrow to be ploughed. It cuts a narrow line through the straw and manure mixture, throwing it to either side and a clean strip is left down which the blade can run without obstruction.

631.4 SOILS

(*See also* Abs. No. 2319)

[1984] 631.4 : 37
BLANCK, E. Die Bedeutung der Bodenkunde für Landwirtschaft und Wissenschaft als Forschungs- und Lehrfach. **[The importance of pedology for agriculture and science as a research and teaching subject.]** *Z. PflErnähr. Düng.* 45, 1949 (96-105). [G.]

In the curriculum of agricultural colleges pedology should be treated as an independent branch of science.—B.F.G.

[1985] 631.4 : 535.61
GALLAGHER, P. H. **Fluorescence of soil constituents in ultra-violet light.** *Nature* 164, 1949 (275-276). [Univ. Coll., Dublin]

The fluorescence obtained with different soils and the use of solvents for extraction of organic substances from soils for examination by a screened ultra-violet lamp are discussed.

[1986] 631.4 : 549 : 537.531
CHEMURGIC DIGEST. **Geiger counter X-ray used in soil tests.** *Chemurgic Digest* 8, No. 8, 1949 (18).

A new device, the Geiger counter X-ray spectrometer, is being used for rapid identification of minerals in soils. Diffraction patterns from the various contents are drawn on paper by the recorder attachment and the intensity is measured by the counter.

631.41 SOIL CHEMISTRY

(*See also* Abs. Nos. 2065, 2151, 2279)

[1987] 631.41
GOY, S. Agrikulturchemie und Landwirtschaft. **[Agricultural chemistry and agriculture.]** *Z. PflErnähr. Düng.* 45, 1949 (89-95). [G.]

The main results of research work in agricultural chemistry up to the present time are reviewed.—B.F.G.

[1988] 631.411.2 : 631.434
DRESCH, J. Croûtes calcaires et limons rouges en Afrique du Nord. **[Calcareous crusts and red silts in North Africa.]** *Ann. Géogr.* 58, 1949 (89-90). [F.]

A brief review of the probable origin and age of the two soil types.

[1989] 631.411.4
GORHAM, E. **Some chemical aspects of a peat profile.** *J. Ecol.* 37, (24-27). [Univ. Coll. London]

Detailed results are tabulated of analysis of a peat profile at Striber's Moss on the Leven estuary, Lancs., giving horizon depths, pH, conductivity, redox potential, water and ash percentage of dry weight, alkalinity, exchangeable bases and H, also content of Ca, Fe and NH_3. Some of the variations show relationship to the vegetational composition of the peats, e.g., the *Eriophorum vaginatum* layer has low water content, relatively low conductivity and pH and high ash content. It is peculiar in presenting low exchangeable-base and H figures compared with layers above it, but a distinct increase with depth in its own layer, also in being an oxidizing region with Fe in the ferric state.

Fen peat is high in Ca and Fe content, and *Sphagnum* peat has a high Ca/Fe ratio.

[1990] 631.414.2
SEAY, W. A.; WEEKS, M. E. **The fractionation and properties of clays from the surface soils of the Pearman and Maury series.** *Proc. Soil Sci. Soc. Amer. 1947*, 12, 1948 (24-28). [Ky. Agric. Expt. Sta., Lexington]

Total chemical analyses of five fractions.

[1991] 631.414.2
SMITH, A. H. V.; EVANS, I. **Sensitivity of clays to remoulding.** *Nature* 164, 1949 (319). [Army Op. Res. Group, Broadoaks, W. Byfleet, Surrey]

Sensitivity observations were made by means of an instrument devised in the Broadoaks laboratory. Degree of sensitivity appears to be correlated with the Atterburg limits and with relative consistency as found in the natural clay. (Graphs are given). At a given relative consistency, mimimum sensitivity occurs in clays with a plasticity index from 45-55.

Two probable causes of sensitivity are, damage after sedimentation by slow consolidation, and temporary disarrangement of particles, adsorbed cations and water molecules. Soils with intermediate plasticity index show lower sensitivity than those with high or low extremes, probably owing to their less complex structure.

[1992] 631.414.2 : 631.416.872
MACKENZIE, R. C. **Nature of free iron oxides in soil clays.** *Nature* 164, 1949 (244). [Macaulay Inst., Aberdeen]

A clay used in differential thermal analysis, with a view to elucidating its mineral composition, had a free iron oxide content of 31%. It occurred at a depth of 48-52 inches of a soil developed on basic igneous till and had been treated several times with H_2O_2 on the steam bath to remove organic matter. Its thermogram showed a strong exothermic peak at about 345°C. and resembles the curve for "cold-precipitated" hydrated ferric oxide. Several other soil clays have been found to contain this type of ferric oxide.

[1993] 631.414.3
MALIANOV, A. P.; BIRIUKOVA, A. P. **[The mechanical absorption by soils of solid particles from filtering suspensions.]** *Pochvovedenie* 1949 (416-422). [R.] [Saratov Univ.]

Complete absorption of the solid particles of a suspension when filtered through soil

takes place when the pores of the soil are smaller than the suspended particles. Some absorption will also take place when the soil pores are slightly larger as a result of the particles of the suspension partly filling up the pores. The mechanism of the process becomes very complicated when dealing with soils having aggregate structure.

[1994] 631.414.3

WIKLANDER, L. **Adsorption equilibria between ion exchangers of different nature. I. Release of cations from soil by adsorption on exchange resins.** *Kgl. LantbrHögsk. Ann.* 16, 1949 (670-682). [E.] [Inst. Pedol.]

The distribution of a monovalent ion (M), in equilibrium with H, between 2 acidoids of different properties and mixed in different ratios has been calculated. It has been shown how the exchange capacity and the strength of the acidoids influence the distribution and how a practically complete adsorption of the ion M on the stronger acidoid can be brought about by an appropriate choice of the ratio of the 2 acidoids. The applicability of the method for the determination of releasable ions in a soil was investigated, a mineral soil saturated with certain ions and a sulphonated resinous exchanger, Wofatit K, being used. The major or total amount of releasable ions was extracted after 2 hours. The grain size apparently had no influence on the distribution of the ions examined and for the reaction time used. A resin/soil ratio $=1$ was high enough to enable a practically complete extraction of the releasable ions. It is suggested that the exchange method can be used for a rapid base desaturation of a soil and determination of the amount of adsorbed cations and free salts.—From author's abstract.

[1995] 631.414.3 : 546.19

MARGULIS, H; BOURNIQUEL, R. Action de l'acide arsénieux sur le sol. **[Action of arsenious acid on the soil.]** *Ann. Agron.* 19, 1949 (550-566). [F.] [Sta. Agron., Toulouse]

Investigation of soils in different states of saturation has shown that As_2O_3 is fixed by free Al and Fe and also by clay. The amount fixed by Al and Fe is independent of the degree of saturation and the normal pH range of soils. With clay, however, it depends markedly on saturation, beginning simultaneously with displacement of the acid H of clay by Ca and reaching completion when no more insoluble Ca silicate can be formed. Between these limits the fixation rate follows the As_2O_3/CaO ratio, and increases, but not proportionately, with increased concentration of As_2O_3. A similar falling off at higher concentrations is shown with Al and Fe. Liming increases a soil's fixation of As_2O_3, and calcareous soils fix large amounts.

Soils treated with As_2O_3 suffer reduction in base-exchange capacity but their replaceable bases increase.

[1996] 631.414.3 : 631.432.3

NAYAR, M. R.; SHUKLA, K. P. **Base exchange, adsorption, permeability and related properties of soils.** *J. Sci. Indust. Res. (India)* 8, 1949 (137-140). [Lucknow Univ.]

A quantitative relationship exists between base-exchange capacity and adsorption, exchange reaction, swelling and permeability. The clay content and nature of the exchangeable cation also affect these properties. An investigation to find a suitable liming material for canal beds to prevent loss of water by seepage led to treatment of soils with Na_2CO_3 or the local naturally occurring alkaline soil. A series of adsorption experiments with different strengths of Na_2CO_3 revealed that adsorption of Na_2CO_3 by soils is governed by Freundlich's adsorption isotherm. Equations are given for base exchange and adsorption, exchange reaction and the percolation of water in Ca-Na salts. The influence of the size of the exchangeable cation is discussed.

[1997] 631.415.1 : 545.372

REINHOLD, J. Elektrometrische Bestimmung der Wasserstoffionenkonzentration in Böden in NaCl-Lösung. **[Electrometric determinations of hydrogen-ion concentration of soils in NaCl solution.]** *Z. PflErnähr. Düng.* 42, 1948 (139). [G.]

Common kitchen salt gave corresponding values to those obtained with KCl in determining the H-ion concentration.—B.F.G.

[1998] 631.415.36 : 546.22
CEYLON DEPARTMENT OF AGRICULTURE. **Studies on Ceylon soils.** *Ceylon Dept. Agric. Rept. 1947*, 1949 (D15-D16).

The slow rate of percolation of water in saline calcareous soils was increased twentyfold in 3 months by application of 4 tons of S. Application of 10 tons/acre showed no further improvement. 1 ton/acre of S or 4 tons of gypsum improved the rate of percolation tenfold on sticky, heavy soil.

631.416 COMPOSITION OF SOILS

(*See also* Abs. Nos. 2114, 2298, 2333, 2338)

[1999] 631.416 : 631.81
VOLKERDING, C. C.; STOA, T. E. **What is happening to our soil fertility.** *N. Dak. Agric. Expt. Sta. Bull.* 10, 1947 (3-12). Biol. Abs. 23 (1273).

In 33 years on N. Dakota plots a decrease of 20% total N has occurred in the surface soil under a 4-year rotation of corn or potatoes, wheat, clover, and oats or barley. The addition of manure, crop residues and commercial P fertilizers has not reduced the loss. An average decrease of 42% in available P has occurred on plots not receiving super., but where 60 lb. of P_2O_5 has been added every 4 years, available P has been maintained or increased; soils have become less acid, but reaction changes have not been great except where Ca has been added every 4 years. Larger crop yields have resulted from additions of manure, crop residues and fertilizers.

[2000] 631.416.1
DROUINEAU, G.; LEFÈVRE, G. Première contribution à l'étude de l'azote minéralisable dans les sols. **[First contribution to the study of mineralizable nitrogen in soils.]** *Ann. Agron.* 19, 1949 (518-536). [F.] [Sta. Agron. Biochim. Végét., Antibes]

Evidence from extensive field experiments points to a phase of pre-mineralization of N in soils. In fallow soils, the amount of mineralizable organic N (as estimated by incubation) seems to be determined in spring by a proliferation of certain micro-organisms during cold weather. A second phase, that of mineralization proper, follows in summer, but by December, partial reversion will have occurred. In cultivated soils the processes are largely masked by the influence of rhizosphere, crop residues and manuring.

In estimating the N requirements of a soil, therefore, the date of sampling is important, also the determination of mineralizable as well as of mineral N present. Such estimations, combined with those of pH and of assimilable P and K, will indicate when old grassland needs ploughing up. Ploughing and fallowing are advised if the ratio of mineral N (after one month's incubation)/total N is <2, but where a high ratio exists there would be appreciable loss of N, especially in shallow soils, by fallowing.

Clover, lucerne and sainfoin roots add 50-150 kg./ha. to mineral+mineralizable N, the amount depending on the condition of the artificial sod. One experiment showed farmyard manure to be inferior to mineral and other treatments both for N nutrition of crops and for mineralization. Sheep manure, however, readily produces available N, and has considerable residual action.

[2001] 631.416.2 : 619
SHEEHY, E. J.; O'DONOVAN, J.; DAY, W. R. ET AL. **Aphosphorosis in cattle in County Offaly.** *Eire J. Dept. Agric.* 45, 1948 (5-28).

The soils on which the disease occurs are very low in available P, slightly to strongly acid, but contain about 0.35-0.5% of available CaO. Application of P to the pasture, or relaying to grass after a rotation of arable crops, some of which received P, were equally as satisfactory remedies as the feeding of phosphate compounds. Tabulations of the P status of soils and herbage against disease occurrence are presented.

[2002] 631.416.2 : 631.414.3
HARDY, F.; HEWITT, C. W. **Phosphate fixation in British Guiana sugar-cane soils.** *Trop. Agric. Trin.* 25, 1948 (19-22). [Imp. Coll. Trop. Agric., B.W.I.]

In surface samples of two clays and one silt from sugar-cane land in British Guiana a high P-fixing capacity was found. Treatment with $NaH_2PO_4.H_2O$, followed by estimation by the coeruleo-molybdate method and Truog reagent (n/500 H_2SO_4) gave P-fixation as approximately 73% of that absorbed (65% of that added). A second method, used for limed and unlimed soils, involved three months' incubation of moist phosphate-treated soil, and gave results of 78% and 67% of fixation of added P in unlimed and

limed mixtures respectively, the latter being unexpectedly high and suggesting the need for modification of method.

[2003] 631.416.2 : 631.414.3 : 631.411.2
BOISCHOT, P.; SYLVESTRE, P. Solubilisation de l'acide phosphorique dans les sols calcaires. **[The rendering soluble of phosphoric acid in calcareous soils.]** *C.R.* 229, 1949 (596-598). [F.]

Adsorbed P_2O_5 is more easily made soluble by adding organic salts, particularly humates, than by adding neutral mineral salts. The process is one of desorption and the quantity of liquid used is more important than its concentration. In a natural limestone, the desorption of P_2O_5 was greater from the smaller grains: P_2O_5 is adsorbed on the surface and not within the mass of the grains.

[2004] 631.416.2 : 631.85
MATHIEU-REVERDY, G. Besoins des sols du sud-ouest en acide phosphorique et influence de la réduction des fumures phosphatées depuis 1940 sur la production végétale. **[Phosphoric-acid requirements of soils in the south-west and the effect of reduction in phosphate fertilizers since 1940 on crop production.]** *Ann. Agron.* 19, 1949 (567-573). [F.] [Sta. Toulouse and Dijon]

Soils of south-western France are generally deficient in assimilable P_2O_5. Reduction of P fertilizers had little effect where the amount used was already low, but yields rapidly fell where moderate applications were normally used. Soils already improved by considerable and repeated applications were not seriously affected. Crop analysis from the poor soils showed very low P_2O_5 content in oats.

[2005] 631.416.4 : 631.821.1
NANDY, N. K. **Influence of lime on soil potash.** *Indian J. Agric. Sci.* 16, 1946 (435-439). [Agric. Res. Lab., Dacca]

Lime as CaO was without action on soil K below pH 6.0 and above 7.0, but between these values liberated K from the soil at rates varying with the amount of Ca supplied, reaching a maximum at pH 7.0. Liberated K re-entered the soil complex when soil was kept in contact with the solution, hence the disappearance of soluble K on standing. Fixation of K is confined within the above pH range.

[2006] 631.416.7 : 581.192
BARD, G. E. **The mineral nutrient content of the annual parts of herbaceous species growing on three New York soil types varying in limestone content.** *Ecology* 3, 1949 (384-389).

Concentrations of Ca, P, K and N were determined for 27 species growing on 3 soils differing in lime content. Capacity for uptake of Ca varied among the plants and was not greatly dependent on Ca level of the soil. Maximum P uptake occurred in the soil richest in P, but not that with the lowest pH. K content was high in moisture-loving plants and lowest in plants from soil intermediate in exchangeable K and in pH. Uptake of N was limited by soil deficiency (except ni one legume investigated) and was not related to total NO_3 and NH_4 in the soil.

[2007] 631.416.7 : 631.472
MONTARLOT, G. Remarques sur l'aspect et la répartition des zones d'accumulation calcaire dans divers terrains. **[The aspect and subdivision of lime-accumulation zones in different areas.]** *Ann. Agron.* 19, 1949 (544-549). [F.] [E.N.A., Montpellier]

The existence of calcareous deposits in soils of different ages is explained. Since they appear at depths of 50 cm. and lower, they create the illusion of a soil horizon. They are highly detrimental to cultivation; when in crust form they hinder percolation of water, root growth and tillage, and when finely divided their Ca is particularly active, causing extreme chlorosis of plants. Although apparently indestructible, their formation may in some cases be checked by avoiding prolonged irrigation with lime-charged water.

[2008] 631.416.856
ERIKSSON, E. **Polarographic investigations on pyrophosphate complexes. II. Cupric pyrophosphates.** *Kgl. Lantbr-Högsk. Ann.* 16, 1949 (72-83). [E.]

A classification of the different forms of Cu in soils is suggested, and, on the basis of the experimental results obtained and of existing data on solubility and complex formation, the use of pyrophosphate as an extractant for soil Cu is discussed.

[2009] 631.416.856 : 631.414.3

SVANBERG, O.; EKMAN, P.; PERSSON, N. E. **Introductory note on the determination of copper fixation in soils by means of E.M.F.'s. of concentration cells.** *Kgl. LantbrHögsk. Ann.* 16, 1949 (545-557). [E.]

Cu-ion concentrations in soil extracts or solutions (without added Cu) are not at present determinable by means of concentration cells, but the Cu-fixing power of soils can be studied by this means and was shown to be clearly related to their organic-matter content and pH. Below pH 2, Cu is not fixed; between 2 and 4.5 fixation increases very rapidly but there is no maximum below pH 6-7. Soils of pH 5.5-7.2 (in KCl) fixed Cu in 24 hours strictly in proportion to their organic content. By Cu-fixation studies, especially in acid solutions, it should be possible to distinguish different qualities of humus. It is stressed that the results of these experiments may not apply to the behaviour of Cu salts added as fertilizers in the field, when the influence of the soil on the Cu salt is of much longer duration.

[2010] 631.416.871.1

SHERMAN, G. D.; TOM, A. K. S.; FUJIMOTO, C. K. **The origin and composition of pyrolusite concretions in Hawaiian soils.** *Pacific Sci.* 3, 1949 (120-123). C.A. 43 (6345).

Pyrolusite concretions are found in small areas in the manganiferous red soils of the Hawaiian Islands, in regions having definite wet and dry seasons. An appreciable number of the concretions, tubular in shape, have developed by deposition of MnO_2 around plant roots. Spherical concretions have been formed by deposition around small nuclei, and irregular-shaped concretions deposited in earthworm burrows and other soil openings. Their MnO_2 content varies from 23.1 to 44.2%; they have less SiO_2 and Fe_2O_3 than the soil. Alternating wet and dry soil provides essential conditions for the solution, leaching, oxidation and precipitation of Mn.

631.417 ORGANIC MATTER

(*See also* Abs. No. 2026)

[2011] 631.417

JOURNAL OF ECOLOGY. **The organic matter in the soil.** *J. Ecol.* 36, 1948 (328-332).

Report of papers read and discussion at a joint meeting of the British Ecological Society and the British Society of Soil Science, April 28, 1948.

[2012] 631.417 : 63

KORTLEVEN, J. Richtlijnen van het compostonderzoek. **[Basis of compost investigations.]** Repr. *T.N.O.-Nieuws* 4, No. 35, 1949, pp. 8. [Du.]

It is estimated that Dutch agriculture requires 3,500,000 tons of organic matter yearly and that normal sources amount to 2,400,000 tons, leaving a deficit of 1,100,000 tons. This gap will have to be filled from sources outside the farm, which means utilizing town refuse and industrial wastes, estimated to supply 1,000,000 tons.

The T.N.O. Institute at Groningen has laid down long-term experiments to evaluate and compare different town-refuse composts including the V.A.M. composts now used on a small scale, and to investigate the soil-organic-matter balance sheet.

A more academic question under investigation is the function and relative proportion and value of 'stable' and 'unstable' humus in soil. Hudig's stable-humus product is being examined.—K.S.

[2013] 631.417 : 631.58

BOHNE, H. Die Bedeutung der Ernterückstände für den Humusgehalt des Bodens. **[The importance of harvest residues for the humus economy of the soil].** *Z. PflErnähr. Düng.* 44, 1949 (65-71). [G.]

Critical remarks on a paper of the same title by S. Gericke who is said to have largely over-estimated the amount of residues left after a cereal harvest (*Z. PflErnähr. Düng.* 35, 1945, p. 229; *Soils and Fert.* VIII, p. 147). The author's experiments indicate a maximum quantity of 2000 kg./ha. of cereal residues. The admixtures of soil amounted to 45-50% of the dry matter of roots plus soil components, in spite of careful cleaning. The proportion of roots to stubble is not greater than 1 : 1.
—B.F.G.

[2014] 631.417.2 : 631.452

BARBIER, G. Humus et fertilité. **[Humus and fertility.]** *Cah. Ingén. Agron.* 4, Nos. 47-48, 1949 (20-22). [F.]

The importance of humus is stressed from points of view of soil structure, plant nutrition and development of soil bacteria. The action

of the different humus fractions is described, and the values of different types of organic manure are compared.

631.42 TECHNIQUE AND ANALYSIS

(*See also* Abs. Nos. 1994, 2008, 2091, 2147)

[2015] 631.42 : 581.48
CHAMPNESS, S. S. **Note on the technique of sampling soil to determine the content of buried viable seeds.** *J. Brit. Grassland Soc.* 4, 1949 (115-118). [Grassland Sta., Drayton, Stratford-on-Avon]

[2016] 631.42.005
WERNER, O. Neue Wege zur Verbesserung des Vegetationsgefässes. [**New ways of improving culture pots.**] *Bodenkultur* 1, 1947 (181-189). [G.] Biol. Abs. 23 (1273).

Two new types of pot are described. In one the plant is irrigated from beneath and the soil lies nearly free on a plate-shaped glass. The second consists of a box (128 × 16 × 13.5 cm.) divided into five equal compartments separated by removable boards which do not entirely enclose the compartments at the back and have a V-shaped incision so that roots can grow from the upper compartment into the lower one. The whole box is so filled that the back is always covered with soil. A wooden lid protects the soil from rain. Small openings for the shoots are closed with paper.

[2017] 631.42.005
KELLEY, O. J.; HARDMAN, J. A.; JENNINGS, D. S. **A soil-sampling machine for obtaining two-, three-, and four-inch diameter cores of undisturbed soil to a depth of six feet.** *Proc. Soil Sci. Soc. Amer. 1947*, 12, 1948 (85-87). [Utah St. Agric. Coll., Logan]

[2018] 631.421 : 631.582
YATES, F. **The design of rotation experiments.** *Comm. Bur. Soil Sci. Tech. Commun.* 46, 1949 (142-254). [Rothamsted]

Problems arising in the design of rotation experiments and the ways in which they can be overcome are discussed under the headings: need to include all possible phases of the rotation in the experiment, relation between rotation period and treatment period, example of an experiment with different rotation and treatment periods, experiments with treatments applied to certain crops in the rotation, comparison of effects of different rotations, examples of experiments to compare different rotations of the same duration, rotations of varying length, example of a rotation experiment with all rotations in all possible phases grouped in a single block, further alternative designs for rotations of varying length, other points of importance in design.

[2019] 631.422/3
HENDE, A. VAN DEN La signification de l'analyse chimique du sol. [**The significance of soil analysis.**] *Rev. Agric. Bruxelles* 2, 1949 (511-517). [F.] [Inst. Agron., Ghent]

Chemical analysis of soils is strongly advocated for the establishment, by correct fertilizing, of the balance of nutritive salts with its bearing on crop production and stock feeding. The scope of analysis and chief methods employed are reviewed, with emphasis on the importance of interpreting results in terms of the soil types in question. The value of plot experiments, pot cultures (Mitscherlich and Neubauer methods) as well as plant analysis as supplements to soil analysis is discussed.

[2020] 631.423 : 631.416.846
STACE, H. C. T. **The spectrochemical determination of magnesium in soil extracts by the Lundegardh air-acetylene flame technique.** *Aust. J. Counc. Sci. Indust. Res.* 21, 1948 (305-307).

Abnormally high Mg values were found where the strongest standard contained Ca M/4000, Mg M/12.5, K M/12.5 and Na M/15.2. The molar Ca : Mg ratio was 0.0031 : 1 whereas that in many Australian soils is between 0.5 : 1 and 7 : 1. The curve obtained from a new standard with 1 : 1 ratio of Ca : Mg, gave values for Mg which closely approached the chemical values. It is concluded that the standards must approximate in their Ca concentration to that of the samples if correct values for Mg are to be obtained.

[2021] 631.423.3
TOTH, S. J.; PRINCE, A. L.; WALLACE, A. ET AL. **Rapid quantitative determination of eight mineral elements in plant tissue by a systematic procedure involving use of a flame photometer.** *Soil Sci.* 66, 1948 (459-466). [N. J. Agric. Expt. Sta.]

Determination of Ca, Na, K, Mg, Fe, Mn, P and S in plant tissue.

[2022] 631.423.3 : 631.416
MITSCHERLICH, E. A. Die "Chemische Bodenanalyse". **["Chemical soil analysis".]** *Z. PflErnähr. Düng.* 42, 1948 (97-103]. [G.]

As all applied chemical and biological methods of soil analysis fail to show the real P and K requirement of a field, the author proposes replacing the "chemical analysis" by a simple field trial to be carried out by the farmers. The processes occurring under natural conditions cannot be reproduced by any of the present methods which are based on Liebig's law of the minimum, but neglect the fact that all other growth factors are affecting the yield in the same manner. The agricultural research stations should use accurate pot-experiment technique instead of chemical soil analysis.—B.F.G.

[2023] 631.423.3 : 631.416.2
JESSEN, W.; CONSTANTIN, G. Zur Methodik der Phosphorsäurebestimmung und der pH-Messung bei Bodenuntersuchungen. **[Remarks on the technique of phosphorus determinations and pH-measurements in soil tests.]** *Z. PflErnähr. Düng.* 44, 1949 (168-171). [G.]

The authors report some experiences in carrying out P determinations (lactate method) and pH measurements. As the most frequent mistakes in P determinations occur by the use of a too weak $SnCl_2$ solution, its daily preparation and examination with an iodine solution is advisable. For pH measurements a burette instead of an automatic pipette saved considerable time in measuring out KCl and acetate solutions. —B.F.G.

[2024] 631.423.3 : 631.416.4/5
IVANOV, D. N. **[The use of the electron multiplier for the determination of the alkali elements.]** *Pochvovedenie* 1949 (423-426).

By means of photoelements, electron multipliers and particle counters it is possible to measure the intensity of the lines Li-6708A, Na-5890/95A, K-7665/99A, Rb-7800A, Cs-8521A. By this means total, exchangeable and soluble Na and K can be rapidly and accurately determined in soils.

[2025] 631.423.3 : 631.416.8
ERIKSSON, E. **Polarographic investigations on pyrophosphate complexes. I. Ferric and ferrous complexes.** *Kgl. LantbrHögsk. Ann.* 16, 1949 (39-48). [E.] [Dept. Pedol.]

Pyrophosphates, which form complexes with heavy-metal ions, are of interest in the study of trace elements in soils: the present series of studies aim to obtain more adequate information about their nature and properties. Study of the complexes formed in Na pyrophoshate-$FeCl_3$ solutions points to the existence of a dipyrophosphato ferric complex in weakly acid solutions and a dihydroxy monopyrophosphato ferric complex in neutral and slightly alkaline solutions.

[2026] 631.423.3 : 631.416.871.1
HEINTZE, S. G.; MANN, P. J. G. **Studies on soil manganese. Part 1. Pyrophosphate as extractant of soil manganese. Part 2. The exchange properties of the manganese of neutral and alkaline organic soils.** *J. Agric. Sci.* 39, 1949 (80-95). [Rothamsted]

A method for estimating divalent Mn in neutral pyrophosphate solutions has been developed. By means of the dismutation reaction it is shown that the Mn of pyrophosphate extracts at pH 9.4 of mineral soils of low organic matter content is in divalent form. The reverse dismutation reaction may occur during extraction of soils with neutral pyrophosphate solution and the presence of trivalent Mn in such extracts cannot be taken as proof of the existence of trivalent Mn in the soils. Since pyrophosphate extracts of organic soils reduce MnO_2 and the higher oxides in soils, the presence of divalent Mn in these extracts cannot be taken as proof of the existence of divalent Mn in the organic soils. The use of the reverse dismutation reaction to investigate the nature of Mn higher oxides in soils is restricted to mineral soils low in organic matter. Only a small part of the Mn taken up by organic soils in the presence of ammonium acetate could be recovered by subsequent repeated

extractions with ammonium acetate; the recovery was increased by the addition of low concentrations of Cu, Cd, Ni or Zn salts. In attempting to extract metal-organic complexes 3 fractions of organic matter were obtained, one water-soluble after extracting the soil with NaCl, one soluble in pyrophosphate and one soluble in 2% NaOH. Mn or Cu added as sulphate during the NaCl extraction and retained in a form not exchangeable with Na ions was recovered in the subsequent water and pyrophosphate extracts. In the water extracts the Mn and Cu were still combined with the organic matter, apparently in the form in which they were originally present in the soil.

The hypothesis is advanced that part of the Mn of neutral and alkaline organic soils is present as complexes with the organic matter. Conditions under which the combination of the soil Mn in such complexes could cause Mn deficiency in plants are discussed.

[2027] 631.423.3 : 631.416.871.1
NYDAHL, F. **Rapid procedures for the determination of manganese in soil extracts and plants.** *Kgl. LantbrHögsk. Ann.* 16, 1949 (65-71). [E.]

A procedure is detailed which shortens the time required to obviate the effects of chlorides and organic matter in the soil extract. Mn^{++} is oxidized to MnO_4^- by NH_4 peroxidisulphate in the presence of Ag at a concentration as low as 10^{-5}M. The oxidation takes place in 0.3-0.5 M HNO_3 and at least 0.1 M H_3PO_4, which prevents MnO_2 formation. Cl is made harmless by complex formation with Hg^{++}. Organic constituents became oxidized to compounds stable enough not to reduce the permanganate during spectrophotometric analysis. A remaining turbidity is corrected for by reducing the permanganate and determining the extinction produced by the turbidity. The method is more rapid than and at least as accurate as the periodate method.

[2028] 631.423.3 : 631.811
ENGELS, O.; DEIBIG, A. Die Feststellung der Gesamtnährstoffe (P_2O_5 and K_2O) neben den wurzellöslichen Mengen als Hilfsmittel zur Beurteilung der Düngebedürftigkeit der Böden. **[Determination of the total nutrient content (P_2O_5 and K_2O) and the root-soluble content as a means of ascertaining the fertilizer requirement of soils.]** *Z. PflErnähr. Düng.* 44, 1949 (125-130). [G.]

The figures of the content of total P and K (in 10% HCl) and soluble P and K (by the lactate method) were compared in 18 light soils. In spite of a low content of soluble P and K in certain samples (under 10 mg./100 g. of soil) the total content of P and K was found to be adequate. The recovery of these unavailable nutrients should be encouraged by suitable cultivations, cropping with legumes, liming, etc. The value of determining both available and total contents is stressed.—B.F.G.

[2029] 631.423.3 : 631.811.4
MANSHARD, E. Prüfung der Schnellmethode Mados zur Bestimmung des Kalkbedarfs von Böden. **[Examination of Mados's rapid method for estimating the lime requirement of soils.]** *Z. PflErnähr. Düng.* 42, 1948 (131-138). [G.]

The Mados method (see *Soils and Fert.* VII, p. 138) for estimating the lime requirement of soils was compared with the methods of Schachtschabel and Uhl. In most cases Mados's method gave parallel but higher values, corresponding results being obtained only with strongly acid soils.—B.F.G.

[2030] 631.423.3 : 631.811.4
GOY, S. Kritisches zur Kalkbedarfsbestimmung nach Schachtschabel-Lederle. **[Criticism of the Schachtschabel-Lederle method of estimating lime requirement.]** *Z. PflErnähr. Düng.* 44, 1949 (108-119). [G.]

The lime requirement as estimated by the Schachtschabel-Lederle method is several times higher than by the Goy-Roos method, but field experiments have proved that liming according to the indications of the latter method as to the lime requirement of the soil provides a sufficient lime supply to obtain highest yields. The author concludes that the electrometrical rapid-titration method of Goy-Roos is a reliable method, and that for practical purposes the application of lime up to complete saturation of the soil is uneconomic.—B.F.G.

[2031] 631.423.4

KHANNA, K. L.; PRASAD, S. N.; BHATTACHARYA, P. B. **Improvements in colorimetric determinations. Part II. A rapid method for estimation of organic carbon in soils.** *Proc. Indian Acad. Sci. B* 30, 1949 (11-16). [Cent. Sugar Res. Sta., Pusa, Bihar]

A rapid method was evolved for photoelectric colorimetric determination of organic C, with advantages over the wet-combustion method of Walkley and Black. Colour standards were prepared from six soil samples of known organic-C content (estimated by Walkley and Black's method) by treating them with n. $K_2Cr_2O_7$ followed by concentrated H_2SO_4 and collecting the liquid after stirring, cooling and settling. The standards ranged from bright yellow for 106 mg. organic C/100 g. of soil to bright green for 778 mg. The method closely reproduces the results given by the standard method.

A slightly simpler micro-technique was used for a field method.

[2032] 631.423.4

KURMIES, B. Humusbestimmung nach dem Bichromatverfahren ohne Kaliumjodid. **[Humus determination by the bichromate method without potassium iodide.]** *Z. PflErnähr. Düng.* 44, 1949 (121-125). [G.]

A simple but accurate method of determining the humus content without the use of potassium iodide is described. For the titration of the remaining bichromate, $FeSO_4$ (or ferrous ammonium sulphate) and potassium permanganate are used.—B.F.G.

[2033] 631.423.7 : 631.414.3.03

MUKHERJEE, S. K.; GUPTA, S. L. **The limiting value of the base exchange capacity of soils and clays.** *Indian J. Agric. Sci.* 16, 1946 (442-444). [Univ. Coll. Sci. Technol., Calcutta]

Limiting values of base-exchange capacity in a H soil, a H clay and a H bentonite, were investigated as follows. Lime uptake was estimated by (1) single and repeated treatment with half-neutralized p-nitrophenol, also (2) by continued treatment with half-neutralized phenol, the Ca concentration being the same in both. Results were lowest for single treatment with (1), higher for repeated treatment and higher still for (2).

To estimate adsorption of Mg and Ba and hence to calculate base-exchange capacity, the soils were kept for 16-18 hours in contact with 4.5 n. $MgSO_4$ solution, 4.0 n. Ba acetate solution and 8.5 n. $Ba(SCN)_2$ solution respectively, and then leached for six hours. The first gave a lower base-exchange capacity than Parker's method in which Ba acetate-NH_4Cl is used. From saturated 4.0 n. Ba acetate, more Ba was adsorbed than in Parker's method and from the third solution, used with H bentonite, the highest result was obtained. For practical purposes Parker's and Schollenberger's methods remain suitable.

[2034] 631.425

BAVER, L. D. **Practical values from physical analyses of soils.** *Soil Sci.* 68, 1949 (1-14). [Hawaiian Sugar Planters Assoc.]

The uses of physical analyses in (1) diagnosing and correcting soil conditions troublesome to crops, (2) soil classification and the assessment of potential land use, (3) soil and water conservation, drainage, irrigation, terracing, tillage and soil stabilization are shortly described.

[2035] 631.425 : 539.214

KURON, H. Zur Frage der Plastizität der Böden und ihrer praktischen Bedeutung. **[The plasticity of soils and its practical significance.]** *Z. PflErnähr. Dung.* 42, 1948 (140-148). [G.]

After reviewing several papers on this subject the author discusses the characterization of the plastic properties of the soil. The determination of the "Rissgrenze" ("fissure limit") of the soil is a suitable method, in which a uniformly prepared series of horizontal cylinders of soil of graded moisture content is subjected to radial compression under standard conditions. The percentage water content of the sample which just shows fissuring is taken as the characteristic. Results lie about 4% higher than Atterberg's rolling limit.—B.F.G.

[2036] 631.425 : 539.41
BODMAN, G. B. **Methods of measuring soil consistency.** *Soil Sci.* 68, 1949 (37-56). [Univ. Calif.]

Methods for measuring resistance to deformation by mixing, impact, rolling, penetration and various compression and shearing treatments are described.

[2037] 631.425.22 : 581.032.3
DE JORGE, W.; TOLEDO PIZA, M. DE Obtenção rápida e precisa da unidade de murchamento nos solos do Estado de São Paulo, por meio da umidade equivalente. **[Rapid and accurate determination of wilting point of soils of São Paulo by means of moisture equivalent.]** *Rev. Agric. Piracicaba* 23, 1948 (249-257). Biol. Abs. 23 (1263). [Pt.]

Calculations were made with the equation wilting point=0.66 moisture equivalent+0.29. A method to determine moisture equivalent in less than 80 minutes is described, assuming that it is possible to get a measurement of the hygroscopic water in less than 30 minutes by using the "speedy moisture tester."

[2038] 631.425.22.005
GREENHAM, C. G. **A portable meter for soil-moisture determinations.** *Aust. J. Counc. Sci. Indust. Res.* 21, 1948 (308-310).

A simple meter is described for measuring soil moisture *in situ*, with the aid of Bouyoucos-Mick blocks or fiberglas blocks. The meter can also be used for soil-temperature determinations, and for field measurements of conductivity.

[2039] 631.425.24
RICHARDS, L. A. **Methods of measuring soil moisture tension.** *Soil Sci.* 68, 1949 (95-112). [U.S.D.A.]

References are included to papers concerning the construction and field performance of tensiometers and the use of porous-clay and cellulose-membrane apparatus for measuring moisture uptake and release at various tensions. Methods for making moisture-retention measurements at known tensions are reviewed, and the relationship of such measurements to the field-moisture properties of soils is briefly discussed.

[2040] 631.425.24
VEIHMEYER, F. J.; HENDRICKSON, A. H. **Methods of measuring field capacity and permanent wilting percentage of soils.** *Soil Sci.* 68, 1949 (75-94). [Univ. Calif., Davis]

[2041] 631.425.31
PAGE, J. B. **Advantages of the pressure pycnometer for measuring pore space in soils.** *Proc. Soil Sci. Soc. Amer. 1947*, 12, 1948 (81-84). [Ohio St. Univ., Columbus]

The instrument, which is described, is used to measure available pore space directly in the field at the prevailing moisture content. For certain types of soil it has advantages over the blotter method of measuring porosity.

[2042] 631.425.4
NIJHAWAN, S. D.; OLMSTEAD, L. D. **The effect of sample pretreatment upon soil aggregation in wet-sieve analysis.** *Proc. Soil Sci. Soc. Amer. 1947*, 12, 1948 (50-53).

Pretreatment greatly influenced yield of aggregates >0.2 mm. When moist soil samples were allowed to dry gradually, aggregation decreased, and when air-dry samples were saturated with water vapour aggregation was restored to field-moisture level, though the moisture content remained low. Wetting by spraying, capillary rise and flooding in vacuo gave high aggregation, mainly of sizes >1 mm. Shaking in an end-over-end shaker reduced aggregation.

[2043] 631.425.4
RUSSELL, M. B. **Methods of measuring soil structure and aeration.** *Soil Sci.* 68, 1949 (25-35). [Cornell Univ.]

Methods of measuring total porosity, pore-size distribution, aggregate-size distribution and aggregate stability and penetrometer methods are shortly described. Methods of measuring the composition of the soil atmosphere, the oxygen-supplying power of the soil and oxidation-reduction potential are shortly discussed or referenced.

[2044] 631.425.5
ARIANO, R. **[Granulometric analysis of soils.]** *Ricerche e Studi Ist. Sper. Stradale T.C.I. e R.A.C.I.* 7, 1947 (141-177). C.A. 43 (5521).

A critical discussion.

[2045] 631.425.5
DEB, B. C.; CHOWDHURY, A. Q. **Failure of the international soda method in estimating clay in a subsoil, as revealed by the base-exchange capacity.** *Soil Sci.* 68, 1949 (251-257). [Dacca Univ.]

A subsoil from Nagpur appeared to have an exchange capacity of about 1000 m.e./100 g. of clay or 500 m.e./100 g. of clay + silt. Experiments showed that fractions other than the clay had a high exchange capacity (coarse sand: 53 m.e./100 g.) and that the results were due in some degree to incomplete dispersion by the international method and in some degree to the presence of partly weathered material in the coarser fractions.

[2046] 631.425.5 : 518.3
TANNER, C. B.; JACKSON, M. L. **Nomographs of sedimentation times for soil particles under gravity or centrifugal acceleration.** *Proc. Soil Sci. Soc. Amer. 1947*, 12, 1948 (60-65). [Univ. Wis., Madison]

Two nomographs give settling times vs. particle diameter for gravity sedimentation in the range 0.2 to 5.0 microns.

[2047] 631.425.5 : 631.414.2
PUFFELES, M. **Improved method of clay determination in some soils of Palestine.** *Agron. J.* 41, 1949 (349-351).

In most Palestinian soils water-soluble salts render unsuitable the direct (pipette) method of mechanical analysis by coagulating the clay fraction. The indirect Beam's "Sudan" method is not accurate for local soils rich in lime, owing again to coagulation. To avoid loss of clay, lime should be completely removed before mechanical analysis, a convenient method of removal being treatment with hot 0.1 n. HCl before suspension. The HCl extract receives distilled-water washings from the residue until the latter is free from Cl, and is then used for determination of Fe and Al.

[2048] 631.425.6
LANGBEIN, W. B. **Computing soil temperatures.** *Trans. Amer. Geophys. Union* 30, 1949 (543-547).

A method is described for computing temperatures at given points in the soil from surface temperatures.

[2049] 631.425.722.61 : 631.432.2
THORNE, M. D.; RUSSELL, M. B. **Dielectric properties of soil moisture and their measurement.** *Proc. Soil Sci. Soc. Amer. 1947*, 12, 1948 (66-72). [Cornell Univ., Ithaca]

[2050] 631.427.3 : 631.85
JONES, G. H. G. **A simple pot culture technique for studying the relative "early availability" of phosphatic fertilizers when added to different soil types.** *E. Afric. Agric. J.* 14, 1949 (201-209). [Dept. Agric., Kenya]

When normal field dressings of 40 and 50 p.p.m. of P_2O_5 were added as super. to P-deficient soils, the recovery with different soils varied from 17 to 22%. This suggested that much larger dressings were necessary for the study of the relative "early availability" of different fertilizers and later 1000 p.p.m. of P_2O_5 was added. The method was useful in noting the relative extra intake of P_2O_5 that took place when different classes of P fertilizers were added to different soil types.

The Neubauer method was modified by making narrower and deeper containers and doubling the amounts of soil and fertilizer used. Adequate aeration and drainage were obtained by adding the necessary amount of water to the soil passing through a 2-m.m. sieve and then teasing this and sieving the damp mixture before putting it into the container. Details of the pot-culture technique and some examples of its use in investigational work are given.

631.43 SOIL PHYSICS

(*See also* Abs. Nos. 1996, 2042, 2125, 2199, 2301, 2342)

[2051] 631.432 : 631.58
FROMMURZE, H. F. **The falling level of underground water. Exhaustion of small springs not due to decline in rainfall.** *Farm. Week. S. Africa* 76, July 13, 1949 (46-49). [Geol. Surv., S. Africa]

Percolation in certain types of soil under summer rainfall in S. Africa is very small. Bare soil allows 12% of the annual rainfall to percolate, grass-covered soil 2% and cropped soil almost nil. Average runoff for S. Africa

is 6% of the annual rainfall. Ever-increasing quantities of water are being pumped from underground reservoirs and evaporation and transpiration return most of it to the atmosphere. A National Water Committee has been established to investigate the hydrological cycle and underground water supplies. Reference is made to work done in the Great Artesian Basin of Eastern Australia and in Arizona and Texas.

[2052] 631.432 : 699
DENISOV, N. YA. **[Estimation of the hydrological role of local shading in the steppes.]** *Pochvovedenie* 1949 (345-347). [R.]

In studying the effect of buildings on soil moisture, it was found that high buildings not only increased the moisture of the soil underneath them but also led to the formation of ground waters, and it is suggested that windbreaks of a suitable width might have the same effect on soil moisture and ground water in the steppes.

[2053] 631.432.21
PASQUILL, F. **Some estimates of the amount and diurnal variation of evaporation from a clayland pasture in fair spring weather.** *Quart. J. Roy. Met. Soc.* 75, 1949 (249-256).

A simplified form of the evaporation formula of Thornthwaite and Holzman was used to evaluate hourly evaporation from a clay pasture during fair spring weather. A substantial diurnal variation was demonstrated, and attention is drawn to a potential source of error where daily mean values of the controlling factors are used.

[2054] 631.432.3
KIRKHAM, D. **Studies of hillside seepage in the Iowan drift area.** *Proc. Soil Sci. Soc. Amer. 1947*, 12, 1948 (73-80). [Iowa Agric. Expt. Sta., Ames]

Results of ground-water studies made on an experimental hillside farm and including a wetness survey of the whole farm and a drainage survey of certain problem areas. The main drainage difficulties are due to upward movement of water over the lower areas of hillsides, resulting from artesian pressure developed by downward seepage over the higher slopes.

[2055] 631.432.3
FLETCHER, J. E. **Some properties of water solutions that influence infiltration.** *Trans. Amer. Geophys. Un.* 30, 1949 (548-554).

Poiseuille's approximation is modified to include an air-water interface for the solution in the capillary. The resultant equation includes surface tension, viscosity, pore size, depth of wetting, head of water, wettability of solid and density of solution. Temperature is indirectly included. Relationship between infiltration rate and each factor is given. Experimental evidence is included to support the equation, and lines for further researches are suggested.

[2056] 631.432.3
SMITH, W. O. **Pedological relations of infiltration phenomena.** *Trans. Amer. Geophys. Un.* 30, 1949 (555-562).

The need is emphasised for consideration of genetic and morphological relations. Detailed developments of infiltration relations are given for the more usual genetic profiles. The role of soil structure in infiltration and the subject of fragmented soils are discussed. The view is put forward that not only porosity and texture but also structure and moisture content are usually sufficient to define infiltration phenomena.

[2057] 631.432.3 : 551.48
SCHIFF, L.; DREIBELBIS, F. R. **Movement of water within the soil and surface runoff with reference to land use and soil properties.** *Trans. Amer. Geophys. Un.* 30, 1949 (401-411).

Storms were analysed in a study of rates of soil-water movement, particularly as they effect surface runoff. Infiltration rates as high as 8 inches/hour occurred. Percolation rates at the bottom of the top soil were 0.60-0.04 inches/hour for silt loams. Transmission velocities, expressed in linear inches/hour for top soil and subsoil were: cultivated silt loam 20 and 0.83-1.5; forested silt loam 37.5 and 7.5. Runoff occurred when the rate of rainfall required a transmission rate greater than could exist in the soil at a given soil moisture. Little runoff occurred when the storage space available within the top soil exceeded the total ground rainfall. Rates of infiltration decreased and approached a

constant rate as the top soil approached saturation. After saturation of the top soil the low transmission rates in the subsoil became the controlling factor.

The time required for soil-moisture depletion in different soil types is shown. In the interval between two large storms, sufficient storage space developed in the top soil and subsoil to prevent runoff, but since low transmission rates in the subsoil prevented full use of this storage space in the subsoil, runoff occurred.

[2058] 631.432.3 : 631.544.7
RULE, G. K. **An infiltration study.** *Soil Conservation* 15, 1949 (58-59, 65-66). [S.C.S., U.S.A.]

In an attempt to increase underground water, an experiment showed that percolation rates of water applied continuously on undisturbed soils declined after a few weeks. Settling ponds each of $\frac{1}{000}$ acre in area were treated with agricultural waste material such as maize stalks, straw, cotton-gin trash and boll hulls. Cotton-gin trash either disced in or placed on the surface was the most effective in increasing percolation. The highest percolation rates are obtained after a drying-out period of the soil, followed by a period of ageing of the applied material. Peak rates of 3-4 times those obtained on undisturbed or untreated soils have been reached and results are beneficial after $3\frac{1}{2}$ years.

[2059] 631.432.4 : 536.666 : 631.432.5
ANDRIANOV, P. I. **[The proportionality between the heat of wetting of dried soils and their hygroscopic moisture.]** *Pochvovedenie* 1949 (332-337). [R.]

The observed constancy of the ratio (0.5) of heat of wetting of soils dried at 105-110°C. to their hygroscopic moisture is explained by the fact that the moisture content of all such soils can be taken as zero and their moisture conditions are thus equipotential. Deviations from this constant ratio may be due to varying drying temperature and time of drying, and also to the fact that complete drying can be achieved at a much lower temperature than is usually assumed to be necessary.

[2060] 631.432.4 : 631.414.33
SMITH, R. M.; BROWNING, D. R. **Soil moisture tension and pore space relations for several soils in the range of "field capacity".** *Proc. Soil Sci. Soc. Amer. 1947*, 12, 1948 (17-21). [S.C.S., U.S.D.A.]

In a study of volume weights, total pore space and water contents under various conditions of wetting and draining it was shown that when soils were artificially soaked and then drained for 2 days, the moisture contents were always greater than the laboratory moisture equivalents. Moisture tensions were 25-125 cm. of water column. Pore-space analyses from natural tension curves indicated that the moisture equivalent corresponds to about a 500 cm. tension.

[2061] 631.432.4 : 631.51
ALLMAN, M. S.; KOHNKE, H. **The pF of soil moisture at the wet limit of the plowing range.** *Proc. Soil Sci. Soc. Amer. 1947*, 12, 1948 (22-23). [Purdue Agric. Expt. Sta., Lafayette]

The wet-ploughing limit varied from pF 1.8 to pF 3.0. For medium and heavy soils the limit was pF 2.7-3.0. The lower pF limits found for sandy soils were probably associated with the fact that the structure of these soils is not permanently damaged by wet ploughing.

[2062] 631.433 : 632
HUTCHINS, L. M. **Soil aeration—its importance to plant growth and disease control.** *Proc. Natl. Shade Tree Conf. U.S.A.* 23, 1947 (17-28). Biol. Abs. 23 (1266).

[2063] 631.433.2 : 631.452
CHERNENKOV, A. D. **[The effect of a temporary excess of moisture on the soil and on plant growth.]** *Pochvovedenie* 1949 (474-483). [R.]

A clay soil was kept in a waterlogged condition for 20 days, then well aerated for 24 hours, put in large pots, fertilized and sown with sugar beet. For some weeks after emergence the appearance of the plants in the control pots was distinctly better than in those containing previously waterlogged soil, but subsequently the control pots went ahead and gave yields of roots 5-50% higher, and of tops 100-300% higher than in the waterlogged soils. The differences in favour

of the controls were highest where organic manures were used. Uptake of nutrients was much greater in the controls. Similar results were obtained in small field experiments. Evidence was obtained that the harmful effects of previous waterlogging were due to denitrification, reversion of phosphates and loss of activity in the aerobic microflora. Part of the unproductiveness of podzolic and gley-podzolic soils can be attributed to their liability to temporary excessive moistening.

[2064] 631.434 : 631.414.3
GAREY, C. L.; MCHENRY, J. R. **Dependence of certain physical and chemical measurements in a soil profile on the type of water-stable aggregate.** *Proc. Soil Sci. Soc. Amer. 1947*, 12, 1948 (44-49). [Neb. Agric. Expt. Sta., Lincoln]

The quantitative values for moisture equivalent and base-exchange capacity of soils were increased by dispersing soil aggregates.

[2065] 631.434 : 631.416.7
PETERSON, J. B. **Calcium linkage, a mechanism in soil granulation.** *Proc. Soil Sci. Soc. Amer. 1947*, 12, 1948 (29-34). [Iowa Agric. Expt. Sta., Ames]

An experiment was designed to test the possibilities of Ca linkage as a mechanism in the formation of water-stable clay films, particularly in the presence of polyuronides, and to test the relation of dispersion, flocculation and thixotropy of clay suspensions to the water stability of clay films formed on drying. The best water-stable films were formed from systems that were dispersed rather than flocculated. Thixotropy was also reduced by excessive flocculation. There was a positive relationship between thixotropy of suspensions and the water stability of the clay films produced therefrom.

A marked effect of Ca on the thixotropy of clay suspensions and on the water stability of clay films is evidence of a Ca linkage operating in the formation of water-stable clay films.—From author's summary.

[2066] 631.434 : 631.433
MAZCERAK, A. P. **Effect of gaseous phase on soil structure.** *Proc. Soil Sci. Soc. Amer. 1947*, 12, 1948 (35). [Berkeley Univ., Calif.]

The stability of synthetic hydrogen aggregates (prepared from kaolinite) was less in aggregates wetted under partial vacuum than in those wetted in air.

[2067] 631.434 : 631.452
NIJHAWAN, S. D.; DHINGRA, L. R. **Some characteristics of soil aggregates in cultivated soils of Punjab, India.** *Proc. Soil Sci. Soc. Amer. 1947*, 12, 1948 (39-43). [Dry Farm. Res. Sta., Rhotak]

Aggregates between 3 and 0.25 mm. were the most effective in developing a good tilth. They contained more clay, organic matter, total N and exchangeable Ca and were more water-resistant than finer fractions. Under field conditions they had a higher moisture content than larger aggregates. When crops were grown in soils made up to mixtures of different-sized aggregates, yields were lowest in soils from which aggregates between 3 and 1 mm. were absent.

[2068] 631.434 : 631.544.7
HOPP, H.; SLATER, C. S. **A principle for maintaining structure in clean-cultivated soils.** *J. Agric. Res.* 78, 1949 (347-352).

Clean-cultivated land left bare during winter had poorer soil structure and a lower earthworm population than had land protected by continuous sod or by grass after wheat in rotation. Structure and earthworm population were improved in clean-cultivated land by protecting the surface in winter with an insulative cover. Hay mulch was more effective than asphalt roofing paper. Winter covering had only a slight effect on the structure of soil in sod.

[2069] 631.434 : 631.58
WILSON, H. A.; GISH, R.; BROWNING, G. M. **Cropping systems and seasons as factors affecting aggregate stability.** *Proc. Soil Sci. Soc. Amer. 1947*, 12, 1948 (36-38).

Aggregate distribution was determined by wet screening, and stability by end-over-end shaking. Analyses were made in May, August and November of soils under continuous corn, continuous bluegrass and a corn-oats-meadow rotation. The highest percentages of aggregates $>$ 2 mm. occurred in August. Continuous corn had the lowest, and continuous bluegrass the highest, content of these aggregates, but the continuous-corn aggregates were the most stable. Aggregates

formed under rotation meadow and rotation corn were, however, less stable than those formed under bluegrass.

[2070] 631.434 : 633.2
BELONOZHKO, I. I. **[The productivity of perennial-herbage mixtures and their effect on soil fertility.]** *Sovet. Agron.* No. 7, 1949 (48-58). [R.]

The hay yields of various legumes (lucernes and clovers) and of mixtures of legumes and grasses were compared over several years in different soil zones of the U.S.S.R. The mixtures were superior to the legumes in all zones in both size and constancy of yield. The mixtures also had more favourable effects on soil structure and humus accumulation, and subsequent yields of arable crops were higher on plots which had grown the mixtures.

[2071] 631.435.4
WIKLANDER, L.; HALLGREN, G. **Studies on gyttja soils. I. Distribution of different sulfur and phosphorus forms and of iron, manganese and calcium carbonate in a profile from Kungsängen.** *Kgl. Lantbr-Högsk. Ann.* 16, 1949 (811-827). [E.] [Inst. Pedol.; Inst. Agric. Hydrotechnics]

A 4-m. profile of a gyttja-containing clay soil, typical except in having a limed topsoil, showed the following features:—There were permanent cracks and therefore oxidation conditions to 140 cm., below which the soil was waterlogged and impervious. The aerated part of the subsoil had a low pH and high exchange acidity causing strong P fixation, small amounts of acid-soluble Fe^2, sulphide and organic sulphur, a high content of acid-soluble Fe^3 and exchangeable Mn. The reverse of these conditions obtained in the waterlogged horizon. The high sulphide content showed a maximum at 22 cm. and much organic S was found at this depth. Inorganic sulphate showed a maximum at 170 cm., the decrease upwards being due to leaching and downwards to reduction. Drying considerably decreased the acetic-acid soluble P in the subsoil and decreased the exchangeable Mn, the decrease being greater in the alkaline zone.

[2072] 631.435.4 : 631.3
FARMING. **Hard land problems.** *Farming* 3, 1949 (263).

Ploughing and harvesting difficulties in light and heavy hard soil and the selection of machinery for such work are discussed.

[2073] 631.436.6 : 631.434
SLATER, C. S.; HOPP, H. **The action of frost on the water-stability of soils.** *J. Agric. Sci.* 78, 1949 (341-346). [U.S.D.A., S.C.S.]

Freezing and thawing decreased the water stability of moist soils, but the rate of freezing and thawing had no effect on the loss of water stability. Methods designed to overcome the harmful effects of frost action should be based on reducing the depth and frequency of freezing and on maintaining drainage channels in the soil layer where freezing occurs, so as to keep the moisture content as low as possible.

631.44 SOIL TYPES

(*See also* Abs. Nos. 2317, 2331, 2344, 2346, 2348, 2351, 2352, 2353, 2354, 2357, 2359, 2360, 2363, 2366, 2367, 2374, 2380, 2381, 2400, 2403, 2410, 2414)

[2074] 631.44 : 631.445.7
BAEYENS, J. **The bases of classification of tropical soils in relation to their agricultural value.** *Comm. Bur. Soil Sci. Tech. Commun.* 46, 1949 (99-102). [Univ. Louvain, Belgium]

The classification used in the Belgian Congo seeks to establish a "pedological fertility scale" relating soil characteristics to the kind of crop and the size of harvest that the soil can naturally bear. This implies small-scale detailed surveys, precluding the danger of generalization based on too few profiles or on profiles of a badly-chosen site (long trenches are used rather than isolated pits); this is particularly important in view of later physical and chemical study. This approach also enforces study of the smallest pedological details, e.g., the relative thickness of different horizons of a profile is often decisive for the success of a given crop. The data from such a survey fall into the following categories of decreasing importance for the classification:—climatic factors; morphology of profile; physical properties, especially texture and

structure; water regime; organic matter, especially its distribution throughout the profile; chemical characteristics. Once in possession of the "fertility scale" of a region, a rapid survey of a neighbouring region will establish its native agricultural value and its ability to carry a given crop.

[2075] 631.44:631.445.7

KELLOGG, C. E. **Preliminary suggestions for the classification and nomenclature of Great Soil Groups in tropical and equatorial regions.** *Comm. Bur. Soil Sci. Tech. Commun.* 46, 1949 (76-85).

The first need is for detailed soil surveys with classification according to carefully defined units of the lower categories, these units being based on external and internal characteristics of soils as landscapes with special emphasis on detailed morphological studies using standard methods and terms for describing the characteristics. At the same time a first approximation to the higher categories of classification and agreement as to nomenclature must be reached by international co-operation. There is evidence that the guiding principles, although not the detail of method, used in U.S. surveys are applicable to tropical regions, but the zonal Great Soil Groups of the 1938 U.S. scheme must be supplemented by new groups for the proper classification of tropical soils.

It is proposed that the word "laterite" should be abandoned as the name of a zonal great soil group, and used only for the 4 kinds of materials in certain tropical soils that harden on exposure, and to fossil relicts of such materials. "Latosol" is proposed as the collective for those zonal soils previously called lateritic, as contrasted with podzolic, chernozemic, etc.

A tentative scheme of groups under "Latosol" in Central Africa is discussed and includes Red Latosol (the old "Red Earths"), Earthy Red (the old "Red Loams"), Reddish-brown, Black-red, Red-yellow and Yellow. "Ground-water Laterite" remains the best term for this intrazonal group. Many other Central African groups fall reasonably well within the definitions accepted in the U.S. scheme. The intrazonal group tentatively known as "Ando" soils may be expected to occur in other lands besides Japan.

In the survey of Hawaii, zonal great or sub-great soil groups differentiated include Latosols distinguished as Low Humic, Humic, Ferruginous Humic and Hydrol Humic. The intrazonal soils include Brown Forest, Grey Hydromorphic (gleyed but not dark enough to go with Half Bogs), Bog soils, Solonchak, Solonetz, Paddy soils (artificial hydromorphic and un-named dark Mg clays probably belonging to some great soil group including Regur and Black Cotton soils. The survey also recognizes Alluvial soils, Lithosols and Regosols which are roughly Lithosols from soft-yielding rocks such as loess.

[2076] 631.44 : 631.445.7

PENDLETON, R. L. **The classification and mapping of tropical soils.** *Comm. Bur. Soil Sci. Tech. Commun.* 46, 1949 (93-97). [Office Foreign Agric. Relations, U.S.D.A.]

It is stressed that the attempt should not be made to classify soils, when found, into the now-known great soil groups; available staff should concentrate on the simple mapping of observable soil differences onto available base maps and/or aerial photographs. All soil types or mapping units recognized must be described in detail. Cellulose-acetate monoliths of all the important soil types should be sent to soil-research centres throughout the world. By the use of simple physical and chemical methods, as many samples as possible should be compared of all the soil types mapped. With increasing correlation of the soils being classified and mapped throughout the tropics, arrangement into definite and significant great soil groups will become possible.

[2077] 631.44 : 631.47

LEENHEER, L. DE; DECAESTECKER, R. La détermination de la valeur agricole relative des divers types de sol dans une même région. **[Determination of relative agricultural value of different types of soil in the same locality.]** *Rev. Agric. Bruxelles* 2, 1949 (530-534). [F.] [Inst. Agron., Ghent]

A new technique introduced by Edelman in Holland was used in Belgium to compare the agricultural values of different soil types over an area of 5,000 ha. Specially prepared pedological maps were used for the selection of plots comprising two or more soil types. On each plot 10 squares of area $2\frac{1}{4}$ sq. m.

were harvested from each soil type and average yields were compared. In all, 5 soil types were each tested for 7 different crops and the types best suited to cereals and to roots were determined.

[2078] 631.445.1
BRÜNE, F. Bodenkunde und Moorkultur. **[Pedology and the cultivation of moor soils.]** *Z. PflErnähr. Düng.* 45, 1949 (106-132). [G.]

The classification, chemical composition, physical properties and the biological conditions of moor soils are reviewed. The agricultural value of a moor soil cannot be determined by chemical methods alone, but various aspects of the practical cultivation of moor soils such as kind of drainage, etc. have to be taken into account.—B.F.G.

[2079] 631.445.2 : 552.321.1
BERTHOIS, L. Sur les modalités de formation de l'horizon illuvial dans les sols à évolution podzolique, sur arène granitique dans la région de Louvigné-du-Désert (Ille-et-Vilaine). **[Circumstances of illuvial-horizon formation in podzolized soils on granitic sand in the Louvigné-du-Désert region (Ille-et-Vilaine).]** *Ann. Agron.* 19, 1949 (537-543). [F.] [E.N.A., Rennes]

There is no sharply defined illuvial horizon in podzolic soils formed *in situ* on granitic sand in this region, but instead a network of narrow reddened zones based on the original fissures of the granite rock. The mottled aspect presented by the horizon is due to precipitations around the original fissures which would allow preferential drainage and create favourable conditions for further precipitation of dissolved matter from the upper part of the profile. The process is explained in detail and the three main stages are shown in diagrams.

[2080] 631.445.3 : 631.411.2
DUCHAUFOUR. Sur quelques types de sols forestiers de l'est de la France sur roche-mère calcaire. **[Some forest-soil types of Eastern France on calcareous rock.]** *C.R. Acad. Agric.* 35, 1949 (391-394). [F.]

Ecological and pedological evolution and their interrelations are described from observations on beech forests near Nancy.

In calcareous soils colonized by forest, changes in organic content occur in two phases. The first (rendzina formation) involves progressive removal of carbonate by humic acid, and leaching of the derived bicarbonate, also blackening due to flocculation of Ca humate. The second phase (brown forest soil formation) is the completion of carbonate removal and the decomposition of Ca humate. Some of the mild humus is incorporated as a protective colloid for the clay and Fe oxides, resulting in slight leaching of these and in their accumulation at a lower horizon.

[2081] 631.445.4/5
KOPYT, A. D. **[Agro-hydrological properties of the main soil types of Kazakhstan.]** *Pochvovedenie* 1949 (394-399). [R.]

Data for chernozems, chestnut soils and serozems.

[2082] 631.445.4
TATARINKOV, S. F. **[Characteristics of chernozems of the southern Trans-uralia.]** *Pochvovedenie* 1949 (387-393). [R.]

These soils, produced from heavy clay, highly calcareous parent rocks form a special province of chernozem soils, the peculiarity of which is that the normal chernozem process of soil formation is complicated by the periodic occurrence of solonets formation. As a result the soils display some solonet characteristics in structure and chemical composition.

[2083] 631.445.5 : 631.416.1 : 631.582
McGEORGE, W. T. **Nitrogen problems in semiarid irrigated lands.** *Comm. Fert.* 78, No. 4, 1949 (20). C.A. 43 (6349).

On a typical red desert soil with original N content of 0.052% lysimeters are being cropped with 6-year rotations of lucerne, cotton, hegari and wheat. No N fertilizer has been added and after 12 years the N content has increased to 0.076%.

[2084] 631.445.52 : 631.415.36
RABOCHEV, I. **[The influence of gypseous interlayers in soils of the Golodnaya Steppe on the effectiveness of leaching solonchaks.]** *Pochvovedenie* 1949 (377-386). [R.]

Certain solonchaks in the Golodnaya Steppe have a gypseous horizon containing

4-15% of SO_4, usually at a depth of 60-100 cm. Changes in the vegetation are related to the depth of the gypseous horizon where hygroscopic moisture and soil compactness are maximal and permeability is minimal. This horizon seriously impedes the amelioration of the soil by leaching of salts. It is important to prevent a rise in the water table. Soils of loose texture and with a water table not higher than 2.5-3 m. deep can be reclaimed for agricultural use in one season by leaching.

[2085] 631.445.53 : 631.445.51
MALIUTIN, K. G. **[An excavated solonets in a hillock in Khakassia.]** *Pochvovedenie* 1949 (356-358). [R.]

The discovery of a solonets under the walls of a buried Chinese dwelling in a district where the soils were predominantly chestnut soils was of value in showing that a transition had occurred from solonets soils to chestnut soils under the influence of irrigation. The age of the house has not been definitely fixed.

Seventeen years ago there were solonets soils in the district; these have vanished under irrigation.

[2086] 631.445.6
REIFENBERG, A. **Mediterranean red soils in soil-classification schemes.** *Comm. Bur. Soil Sci. Tech. Commun.* 46, 1949 (97-99). [Hebrew Univ., Jerusalem]

A tentative subdivision of Mediterranean red soils into Terra Rossa on limestone, Mediterranean Red Earths on igneous rock and Mediterranean Red Sands on sandstones is proposed. Comparison of the composition of the clay fraction in various climatic kinds of soil shows the Mediterranean red soils to possess clear differences from the rest, and it is emphasised that these soils should be treated as a separate kind in any classification scheme.

[2087] 631.445.6.061.6
KRYNINE, P. D. **The origin of red beds.** *Trans. N.Y. Acad. Sci.* 2, No. 3, 1949 (60-68). C.A. 43 (5523).

Red minerals, e.g. orthoclase and red FeO pigments (haematite and red limonite) even at 2-3% may colour sediments. Red-bed types discussed are (1) from red soils; (2) from non-red detritus; (3) from old re-worked red beds; (4) from chemical precipitation within the sedimentation basin. Type (2) beds are mainly formed in warm moist climates. Red colour and aridity are not connected.

[2088] 631.445.7 : 631.44 : 551.41
MORISON, C. G. T. **The catena concept and the classification of tropical soils.** *Comm. Bur. Soil Sci. Tech. Commun.* 46, 1949 (124-128).

The topographical catena is the fundamental concept around which future attempts to classify tropical soils must be built. The topographical catena is undoubtedly more marked in parts of the tropics than in temperate regions. Results of detailed work carried out in the Sudan are described and the soil-vegetation topographical catena pattern applicable to various conditions in the tropics is outlined. 3 complexes of soils were found: The eluvial complex, occupying high ground, is the parent complex which provides the material from which the soils of the other complexes are built. The colluvial complex, occupying the slopes, receives material from the eluvial soils and loses some of it to the illuvial soils. It has a zoned pattern of phases which are sufficiently different to carry distinct vegetation. The illuvial complex, in which 5 components were identified, occupies the low-level sites; it is of mixed percentage with drainage impedence. The number of components of each complex found in any one catena is determined by details of topography.

In the eluvial complex as permeability of the parent material decreases so do differences due to climate increase, and at the two extremes of dry and wet conditions soils of completely different profiles are found. In illuvial sites differences in soil development are due to variation in drainage conditions, and the greatest variation occurs in the area of 35-45 inches of rainfall. On colluvial sites the soils are less mature than on eluvial sites, and the number and nature of the soils on the slopes depend on the degree of slope and the nature of the parent material.

[2089] 631.445.7 : 631.452
CROWTHER, E. M. **Soil-fertility problems in tropical agriculture.** *Comm. Bur. Soil Sci. Tech. Commun.* 46, 1949 (134-142). [Rothamsted]

Principles relating to the enhancement of crop-production potentiality of tropical soils are shortly discussed, including the prevention of accelerated erosion; the use of deeply rooting plants; maintenance of organic-matter content, particularly in soils whose inorganic colloids are of low absorptive power; care, in the wet tropics, not to break the cycle of nutrients; the maintenance of structure in seasonal-rain areas; ascertainment of deficiencies and nutrient needs by series of field experiments testing several factors together, with the soil conditions defined to allow the recognition of similar conditions elsewhere: fertility problems are essentially problems of soil classification.

Problems needing study include: the effects of fertilizers compared with those of manure and composts, the reinforcement of organic manures with P etc., grass burning, clean weeding-cover-crop combinations, the N cycle in tropical soils, legumes suitable for tropical leys, mixed-farming systems and the use of shrubs and trees in soil regeneration, fodder provision, etc.

Fertilizer tests should be on standard products, local materials being used only in comparison with these; experiments should be planned in series bringing out average responses of individual crops over a range of soils and of individual soils over a variety of crops.

[2090] 631.445.7 : 631.452
VAN DER MERWE, C. R. **Maintenance of the fertility of the Laterites, Lateritic Red and Lateritic Yellow Earths.** *Comm. Bur. Soil Sci. Tech. Commun.* 46, 1949 (155-156). [Div. Chem. Serv., Dept. Agric., Pretoria]

These South African soils are physically satisfactory, have good reserves of N and P and moderate reserves of K and organic matter. The available P and K are extremely low and medium, respectively, in the top 6 inches and are associated with the organic matter, which becomes quite quickly destroyed on development of the land, with bad effects on structure. They are well leached, very acid and low in adsorbed bases. Moderate quantities of lime applied frequently are required to make them suitable for normal crops. The soils are suited for afforestation or crops needing minimum cultural operations. Under intensive development they rapidly deteriorate physically, and green manure or farmyard or kraal manure must be used to maintain organic-matter content. Basic super. or a mixture of super. and ground rock phosphate or agricultural lime + super. are preferable to super. Wattles, summer cereals, artificial pastures and legumes have been grown well on the Yellow Earths, and on the other soil groups cropping results have varied with the crop from good to doubtful, citrus and vegetables in particular giving doubtful results. Before development, the chemical composition of the clay fractions and the reserve minerals present must be determined.

[2091] 631.445.7 : 631.452
VRIES, O. DE **Remarks on some aspects of the soil-fertility problem in the tropics.** *Comm. Bur. Soil Sci. Tech. Commun.* 46, 1949 (157-160).

Matters discussed relate mainly to soil water and field experimentation. Boulders and large stones resting on clayey fertile soil are useful in keeping the soil covered and moist and should be left in place at least for widely spaced crops. A lalang (*Imperata arundinacea*)-straw cover on flat land causes striking regrowth of starved dried-out Hevea, etc., merely by keeping the soil cool and moist and *Mimosa invisa* as a cover for wide-spaced crops causes striking regrowth for the same reason. The detailed chemistry of an irrigation-fallowing system, as in the Vorstenlanden practice of growing tobacco after irrigated rice, when fertility is raised to a high level, deserves special study.

In field experimentation, the impossibility in hilly districts of the East Indies of finding suitable homogeneous sites for Hevea, which needs plots of $\frac{1}{2}$-$2\frac{1}{2}$ acres, has led to a system —used also in flat country with cereals, etc.— of simple single experiments with a few treatments with at most one replication, but repeated in sufficient localities, preferably together with regular measurements of as many phenomena as possible throughout growth; graphical methods are largely used to work out the correlations. More is gained for general advisory work by a not very

accurate knowledge of a large number of cases under varying field conditions than from accurate knowledge for one locality that holds only for one combination of soil and climate.

[2092] 631.445.7 : 631.47
TEMPANY, H. A. **Land utilization in the wet tropics.** *Emp. J. Expt. Agric.* 17, 1949 (148-156).

Where drainage is unimpeded, as in undulating uplands, heavy leaching and rapid disappearance of organic matter tend to occur, but where drainage is impeded as in the alluvial lowlands, leaching is restrained, mineral fertility is higher and organic matter accumulates: such soils may be of great value for food production when reclaimed by drainage. On uplands permanent crops such as rubber, tea, oil palms, etc., are most suitable, as they allow the nearest approximation to natural conditions, but a limited scope exists for market gardening and for stall-fed animal husbandry. In the lowlands, although the upland crops may grow well, annual crops, especially rice, are well suited to the conditions, and there is scope for animal husbandry.

[2093] 631.445.72
VAN DER MERWE, C. R. **The sub-tropical black clay soils.** *Comm. Bur. Soil Sci. Tech. Commun.* 46, 1949 (43-45). [Dept. Agric., Pretoria]

The Black Clays of the sub-tropical region of South Africa have characteristics and soil-forming factors some of which resemble and some of which differ from those of the chernozems of the Northern hemisphere. They are not solonetsic and it is suggested that they should be classified as Black Soils of the Sub-Tropics.

[2094] 631.445.73(083.72)
VAN DER MERWE, C. R. **A few notes with regard to misconceptions concerning soils of the tropics and sub-tropics.** *Comm. Bur. Soil Sci. Tech. Commun.* 46, 1949 (128-130).

The use of the terms "laterite" and "red loams" is discussed. The difference is stressed between laterite, the indurated quarryable ferruginous or sesquioxidic material, and lateritic types of soil, the illuvial horizon developed in the tropics and subtropics under high rainfall and temperature and efficient surface and internal drainage. Soils with pronounced ferruginous layers similar to lateritic types occur outside the tropics, but the climate is not conducive to a lateritic soil formation. Red loams or clays with good internal drainage, well leached and formed from diabase, occur in S. Africa; others slightly less leached are associated with black clays derived from basalt. Neither is a zonal type, but there is a zonal soil group developed under climatic conditions considered essential for the formation of lateritic soils that shows severe leaching and accumulation of all the lateritic constituents. They are not indurated or quarryable, but should be classified with lateritic soils and not with red loams. The question is raised if induration should be a deciding factor in applying the terms laterite or lateritic.

631.452 SOIL FERTILITY

(*See also* Abs. No. 2091)

[2095] 631.452
VALLANCE, L. G. **Some aspects of the maintenance of soil fertility.** *Cane Grow. Quart. Bull.* 13, 1949 (1-22).

Subjects discussed include factors controlling soil fertility; the effect of micro-organisms and organic matter; maintenance of soil fertility in Ceylon and the effect of organic matter on tea soils; maintenance of fertility in the Sudan; soil-fertility experiments in England and the effect of fallowing; organic matter, trash conservation and mulching in the British West Indies and flood fallowing in British Guiana.

[2096] 631.452 : 631.51
MEYER, L. Das Wesen der Bodenfruchtbarkeit und die landwirtschaftliche Bodennutzung. **[The nature of soil fertility and the agricultural use of soil.]** *Ber. Landtech.* 4, 1948 (7-16). [G.]

A survey of problems and possibilities of soil cultivation in its relationship to soil fertility.

631.459 SOIL EROSION

(*See also* Abs. Nos. 2329, 2347, 2364, 2374, 2402, 2404)

[2097] 631.459 : 631.47 : 627.51
SIGNELL, L. G. **Fighting floods at their source.** *Soil Conservation* 15, 1949 (60-64). [S.C.S., Washington, D.C.]

Now that more than $\frac{3}{4}$ of all farm and ranch lands in U.S.A. are included within soil-conservation districts it is practicable to give technical and other federal assistance on a river-basin basis. The shift to basin-wide surveys of the Upper Mississippi, Rio Grande, Red River, etc., is a development in flood control.

[2098] 631.459 : 631.61
SEN, P. **Thatch planting—a measure in the control of soil erosion.** *Indian J. Agric. Sci.* 16, 1946 (440-441). [Soil Cons. Res. Scheme, Visva-Bharati, Santiniketan, Bengal]

A method is described for planting *Saccharum sara*, a long-leaved grass, in thatch-like formation on spillways and gullies. Erosion was successfully checked from the first season and the plants established themselves during this time on spillways. By the same method, gully heads were prevented from upward extension. For the best results, planting along contours is recommended.

[2099] 631.459 : 631.61
DEMOLON, A. Pédologie et conservation des sols agricoles. **[Pedology and conservation of agricultural soils.]** *Cah. Ingén. Agron.* 4, Nos. 47-48, 1949 (16-19). [F.]

The evolution of soils and their impoverishment by leaching, erosion and human action are briefly discussed. Conservation and restoration measures are described, with examples from various parts of the world.

[2100] 631.459 : 631.61
JACKS, G. V. **Soil conservation prospects.** *Research* 2, 1949 (348-352).

The basic principles of erosion control are described, and it is suggested that in future the economic and social aspects of soil conservation are likely to come to the fore. Short descriptions are given of U.S. soil-conservation districts and of the Stalin plan for Russian agriculture.

[2101] 631.459 : 631.61
TEMPANY, H. A. **Soil-conservation practice in the British Colonial Empire.** *Comm. Bur. Soil Sci. Tech. Commun.* 46, 1949 (185-192).

Methods of erosion control are classified as protective measures depending on earth structures, those depending on living plants, cultural methods, agricultural systems and administrative measures. Topics discussed include the advantages and disadvantages of bunds as compared with contoured wash-stops; grasses and other plants used for contoured strips and spillways in different countries; maintenance of soil fertility by the use of rotational grass fallows and mixed farming and by population transfers; legislative and administrative measures introduced into different countries; need and scope for further research on the erodibility of different soil types and for quantitative measurements.

[2102] 631.459 : 631.61 : 631.3
DYKES, J. C. **Machinery for the conservation farmer.** *Agric. Engng.* 30, 1949 (420-422, 428). [S.C.S., U.S.D.A.]

The design of farm machinery for conservation farming is discussed.

[2103] 631.459 : 631.61 : 631.47
UNITED STATES SOIL CONSERVATION SERVICE. **Guide for soil conservation surveys.** *U.S.D.A. Soil Conserv. Serv.* 1948, pp. 39.

[2104] 631.459 : 631.61 : 631.58
MUSGRAVE, G. W. **Designing agronomic practices to meet specific erosion hazards.** *J. Soil Water Conserv.* 4, 1949 (99-102). [S.C.S., Washington, D.C.]

It is pointed out that the objective of a soil-and-water conservation programme is to improve and preserve the physical properties of the soil. The interaction of natural forces and agronomic practices is discussed.

[2105] 631.459 : 631.86
FREE, G. R. **Efficient use of farm manure for erosion control.** *J. Soil Water Conserv.* 4, 1949 (117-118, 124).

Low-rate application of manure as top dressing was more effective in reducing soil and water losses than a high-rate application

ploughed under. Crop yields were not reduced by substituting top dressing for ploughing under, since over a long period conservation counteracted the fertility difference of the two application methods. The experiment was conducted with a 3-year rotation on a slope of 17%, but a longer rotation is advocated.

631.46 SOIL MICROBIOLOGY

(*See also* Abs. Nos. 2000, 2135, 2172, 2173, 2303)

[2106] 631.461 : 576.809.7
BRIAN, P. W. **The production of antibiotics by soil microorganisms.** *Chem. Indust.* June 18, 1949 (391-393). [I.C.I., Welwyn, Herts.]

It is believed that the production of antibiotics is responsible in part for the numerous cases of antagonistic relationship between soil micro-organisms. It is important that the antibiotics already known and others not yet isolated should be studied in relation to their effect on the more important soil organisms and on the biochemistry and biophysics of microbiological soil processess. Investigations may suggest new methods of approach to control of soil-borne plant diseases.

[2107] 631.461 : 631.81
MARTIN-LEAKE, H. **The living soil complex.** *Int. Sug. J.* 51, 1949 (241-243).

Antibiosis among soil microorganisms is discussed, also the influence of various inorganic fertilizers upon them.

[2108] 631.461 : 631.81
MISHUSTIN, E. N.; PROKOSHEV, V. N. **[Changes in soil microflora resulting from prolonged use of fertilizers.]** *Mikrobiologia* 18, 1949 (30-41). C.A. 43 (6350). [R.]

Prolonged use of inorganic fertilizers in crop rotation, without including grassland, greatly increases the concentration of reactive alumina, lowers pH and the concentration of bases and lessens crop yields. Actinomycetes, non-spore forming fungi, nitrifying bacteria and soil nitrification decrease and bacilli, cellulosytic fungi and myxobacteria increase. The large increase in microbiological activity caused by manure is a major factor in the crop increase which follows. Even with optimum use of manure, lime and inorganic fertilizers, crop rotation should include grassland.

[2109] 631.461.1/3
BROADBENT, F. E. **Nitrogen release and carbon loss from soil organic matter during decomposition of added plant residues.** *Proc. Soil Sci. Soc. Amer. 1947*, 12, 1948 (246-249). [Iowa Agric. Expt. Sta., Ames]

For investigation of C and N transformation in the presence of plant residues, samples of soils were incubated, some with sucrose, others with corn-stalk cellulose and the controls with neither. Half in each category received KNO_3. In a second similar experiment all samples were treated with KNO_3, and one group received both sucrose and cellulose. A third investigation was made using sucrose and cellulose both separately and mixed, in the absence of soil.

In the soil experiments, sucrose and cellulose were extensively decomposed, especially in presence of KNO_3. Cellulose decomposition was accelerated by the presence of sucrose. When sucrose was replaced by sweet clover, decomposition of corn stalks was greatly accelerated by stimulation of microbial action. Sudan grass brought about an increase in both N release and C loss from the organic fraction of the soil.

By means of tracers, mineralization of N was proved not proportional to CO_2 production, and other results showed that addition of energy materials tended to raise N release at a greater rate than general decomposition. Results depended not only on the kind and quantity of energy materials added but also on the original energy status of the soil organic fraction. It appears possible that a large part of the N supplied to succeeding crops by green manures may have its origin in the supposedly stable soil organic matter rather than in the fresh plant residues.

[2110] 631.461.4
SACKS, L. E.; BARKER, H. A. **The influence of oxygen on nitrate and nitrite reduction.** *J. Bact.* 58, 1949 (11-22). [Univ. Calif., Berkeley]

The twofold action of O in denitrification is the suppression of the formation of nitrate- and nitrite-reducing enzyme systems,

and when these are present, decrease of the rate of reduction. Both effects are illustrated quantitatively. The inhibiting effect of air on denitrification is largely reversible over short time intervals. Continuous growth under aerobic conditions does not appreciably reduce denitrification.—From authors' summary.

[2111] 631.461.5

QUARTAROLI, A. Sul meccanismo energetico della fissazione biologica dell'azoto. **[The energetics of the biological fixation of nitrogen.]** *Ann. Fac. Agrar. Univ. Pisa* 9, 1948 (100-106). [I.f.e.g.]

The conditions for nitrogen fixation are reviewed. This process is always strongly endothermic and therefore cannot be performed in isolation by catalysts. It is suggested that some enzymes may act by linking the chemical energy of bacterial and algal respiration (strongly exothermic) with nitrogen fixation: such linkage is not improbable, and some analogies for it are suggested.—R.N.

[2112] 631.461.5

JENSEN, H. L. Nyere Undersøgelser over biologisk Kvaelstofbinding. **[New investigations of biological nitrogen fixation.]** *Tidsskr. Planteavl* 52, 1949 (653-690). [Da.]

A review. Symbiotic N fixation appears to involve a reduction of free N to NH_3 or NH_2OH which reacts with dicarboxyl-ketonic acid to give glutaminic and asparaginic acids. These are either built up into proteins or excreted from the root nodules. The presence of haemoglobin in the nodules is necessary for N fixation, and Mo is required as a catalyst. N fixation by azotobacter seems to take a similar course, except that NH_2OH is not formed, and the process is inhibited by free H and CO.

[2113] 631.461.51

FEDOROV, M. V. **[Fixation of molecular nitrogen by azotobacter in presence of amides and amino acids.]** *Mikrobiologia* 17, 1948 (425-434). C.A. 43 (5522). [R.]

Fixation of atmospheric N by azotobacter is reduced by inorganic N compounds in the soil. Amides do not reduce fixation and amino acids do so only slightly, although small amounts of asparaginic and glutamic acids stimulate azotobacter. Uric and hippuric acids up to 0.02 M, although not utilized, have a slight stimulating effect.

[2114] 631.461.51 : 631.81

GAINEY, P. L. **Effect of inoculating a soil with *Azotobacter* upon plant growth and nitrogen balance.** *J. Agric. Res.* 78, 1949 (405-411). [Kans. Agric. Expt. Sta.]

The addition annually of 1000 lb./acre of super. or of 2000 lb./acre of super + glucose or wheat straw did not influence the longevity of *Azotobacter* introduced into a silt loam of pH below 6.0. The addition of super. and lime to maintain pH at 6.5 enabled *Azotobacter* to survive throughout the 20 years of the experiment. The suitability of this soil after liming as a habitat for *Azotobacter* was enhanced by the annual application of a carbohydrate food such as glucose. There was no evidence that the *Azotobacter* influenced either the crop grown on this soil or the N balance of the soil. The annual application of 2000 lb./acre of wheat straw influenced favourably plant growth and the N balance of the soil, but this cannot be attributed to the activity of *Azotobacter*.

[2115] 631.461.52 : 546.77 : 546.22

ANDERSON, A. J.; SPENCER, D. **Molybdenum and sulphur in symbiotic nitrogen fixation.** *Nature* 164, 1949 (273-274). [Sci. and Indust. Res. Org., Canberra]

Either Mo or S deficiency will inhibit symbiotic N fixation and reduce yield and N content of legumes. Very minute quantities of Mo are required for nitrate utilization in plants. Much greater quantities are needed in symbiotic-N fixation. There was no evidence that S influences the process of symbiotic-N fixation; it appears to increase fixation primarily through its effect on the N metabolism of the plant.

[2116] 631.461.61

FORMISANO, M. **[Cellulose degradation in soils.]** *Ann. Microbiol. (Milan)* 3, 1947 (226-240). C.A. 43 (5891). [I.]

Cellulose degradation is performed primarily by *Cytophaga aurantiaca* and secondarily by some species of *Cellvibrio* and *Cellfalcicula*. The number of bacteria increased with the addition of organic fertilizers to the soil.

[2117] 631.461.61 : 631.461.74
FÅHRAEUS, G. **Agrobacterium radiobacter Conn as a symbiont in cellulose decomposition.** *Kgl. LantbrHögsk. Ann.* 16, 1949 (159-166). [E.] [Inst. Microbiol.]

Experimental results seem to support the view that volatile acids arising in the *Cytophaga* cultures reduce the rate of cellulose decomposition. *Agrobacterium radiobacter* utilizes the acids formed, causing increased cellulose decomposition.

[2118] 631.461.61 : 636.086.25
NILSSON, R.; FÅHRAEUS, G. **On the effect of straw and straw extract on soil and crop, especially in pot experiments with oats.** *Kgl. LantbrHögsk. Ann.* 16, 1949 (729-736). [E.] [Inst. Microbiol.]

An interim discussion of the indications of 2 years' pot experiments in which a seed treatment with straw extract (boiling water, and concentrated so that 1 ml. = 0.5 g. of straw) had favourable effects on the yield of oats when sufficient N was provided. Seed treatment with the extract greatly increased the number of cellulose-decomposing bacteria, especially in the N-treated plots. An inoculation of the seed with a mixture of cellulose-decomposing and nitrogen-fixing bacteria increased the straw effect in N-treated pots. A favourable effect of ground straw on yields in one year was possibly due to its water-soluble substances or to its improvement of the soil structure. Field experiments so far have not confirmed the results of the pot experiments.

[2119] 631.461.71 : 620.19
NEW JERSEY AGRICULTURAL EXPERIMENT STATION. **Is it known how bacteria cause corrosion of steel and iron in soil ?** *N.J. Agric. Expt. Sta. Rept. 1947-48,* 1949 (93).

Where there is deficient aeration, as in waterlogged soils, corrosion occurs with the formation of black iron sulphide. The sulphide-producing bacteria are believed to be responsible for destruction of the metal and it is suggested that the bacteria produce what might be likened to a weak electrical battery in which the current flows from the metal areas where bacteria are growing to other areas where the metal is in contact with air. Corrosion occurs where the bacteria grow and produce sulphide. There was little corrosion of steel that was completely covered with soil even though there was active development of sulphide-producing bacteria.

[2120] 631.461.74
SCHATZ, A.; SAVARD, K.; PINTNER, I. J. **The ability of soil micro-organisms to decompose steroids.** *J. Bact.* 58, 1949 (117-125). [Sloan-Kettering Inst. Cancer Res., N.Y. City]

By means of enrichment cultures with cholesterol substrate, only gram-negative, non-motile rod-shaped eubacteria were isolated from various soils, manures, composts, peat and lake sediment ranging in pH from 3.9 to 7.5. No actinomycetes or moulds were isolated, although, according to Turfitt, Nocardiae were the predominant steroid oxidizers in soils. In comparative studies, fewer steroids were attacked by *Nocardia erythropolis* than by a bacterium isolated by the authors. In shake cultures with 0.1% steroid, several common soil forms developed on ergosterol but not on cholesterol.

[2121] 631.462
MESTRE ARTIGAS, C.; MESTRES JANÉ, A. Aportación al estudio de la fertilización del suelo por medio de hormigueros. **[Contribution to the study of soil fertilizing by burnt earth mounds.]** *Bol. Inst. Investig. Agron. Madrid* No. 20, 1949 (125-163). [Sp.]

A preliminary investigation of the age-old Spanish practice of burning piles of earth containing plant residues and spreading the ashes has shown that soil fertility is considerably increased in this way. It is not suitable for calcareous or humus soils but is excellent for clays, whose adverse physical properties are permanently modified

There is evidence that properly controlled burning stimulates bacterial activity. Heat-sterilized earth was proved to increase yields of various crops, and might become economically important in periods of fertilizer scarcity.

[2122] 631.466.2 : 631.461
SCHAAL, L. A.; FULTS, J. **Some preliminary studies on the antagonism of soil fungi and bacteria to *Actinomyces scabies*.** Abs. in *J. Colo.-Wyo. Acad. Sci.* 3, No. 6, 1948 (39). R.A.M. 28 (418).

Most of the 20 physiological races of *Actinomyces scabies* tested were antagonistic

to the bacteria tested. Certain species of *Aspergillus*, *Fusarium* and *Trichoderma* readily overran the colonies of *Actinomyces scabies*.

631.468.516 EARTHWORMS

[2123] 631.468.516
EVANS, A. C. **A method of studying the burrowing activities of earthworms.** *Ann. Mag. Nat. Hist.* 14, 1947 (643-650). [Rothamsted]

The construction and use of an observation cage are described and burrowing methods of 3 species of earthworms are discussed and illustrated.

[2124] 631.468.516
VELD TRUST NEWS. **Backyard earthworm farm.** *Veld Trust News* 5, No. 9, 1949 (20-21).

The cultivation of earthworms in Virginia is described.

[2125] 631.468.516 : 631.434
HOPP, H.; SLATER, C. S. **The effect of earthworms on the productivity of agricultural soil.** *J. Agric. Sci.* 78, 1949 (325-339). [U.S.D.A., S.C.S.]

Earthworms consistently increased yields in 5 tests by releasing beneficial chemicals from their bodies and by improving soil structure. It is suggested that the release of chemicals occurs chiefly in summer when earthworms are reproducing. In soil of poor structure, soybeans and clover were stimulated more than wheat and grass by the activity of earthworms. Benefits from the physical activity of earthworms were greatest in late autumn, winter and early spring. Soil fauna other than earthworms may affect soil productivity.

631.47 SURVEYS

(*See also* Abs. Nos. 2092, 2402)

[2126] 631.47
HOCKENSMITH, R. D.; STEELE, J. G. **Principles of the land-capability classification.** *U.S.D.A., Soil Conserv. Serv.*, 1949, pp. 17.

Land suited for cultivation and land not suited for cultivation, but suited for permanent vegetation, are each divided into 4 classes according to their physical features which limit their use or impose risks of erosion.

[2127] 631.471/2
LEENHEER, L. DE; WELVAERT, W. La caractérisation des profils pédologiques. **[The characterization of pedological profiles.]** *Rev. Agric. Bruxelles* 2, 1949 (518-529). [F.] [Inst. Agron., Ghent]

The compilation of pedological maps of Belgian soils, and the methods employed for detailed study of profiles are described.

[2128] 631.472.005 : 581.144.2
WEAVER, J. E.; DARLAND, R. W. **Quantitative study of root systems in different soil types.** *Science* 110, 1949 (164-165). [Univ. Nebr., Lincoln]

Complete samples of entire root systems in their natural positions were obtained by using a long, shallow wooden box minus one end. An imprint of this, with missing end uppermost, is made on the smoothed side wall of a trench below the selected sample, and the soil round the imprint removed until a 3-inch-thick monolith protrudes, over which the box is braced. The inner face is cut as a V-shaped ridge, working from both sides, and the whole removed in the box for examination of profile. The extra ridge is then cut away and by repeated soaking and gentle washing with a hose, all the soil is gradually removed from the box, leaving the roots undisturbed for mounting, etc.

Data have been collected comparing the influence of soil type on depth, density and weight-distribution of roots of the same species, and the development of roots of different species in the same soil type. Root distribution in different soil horizons has been studied, also the effect of buried and eroded horizons on root habit.

631.48 SOIL FORMATION

(*See also* Abs. No. 2396)

[2129] 631.48
FINK, J. Der Entwicklungsgedanke in der Bodenkunde. **[The idea of "development" in soil science.]** *Bodenkultur* 3, 1949 (184-191). [G.] [Geol. and Soil Sci. Inst., Vienna]

A discussion of the dynamic, biological and static or geological views of soil formation.

[2130] 631.48 : 551.311.33
BOLSHAKOV, A. F. **[The genesis of loess and loess-like deposits.]** *Pochvovedenie* 1949 (338-344). [R.]

Four stages are distinguished in the formation of loess: (1) Deposition, which may be a deluvial, alluvial, eluvial or aeolian process. (2) Desalinization by the influence of percolating ground and precipitation waters, resulting in the removal of chlorides and sulphates and an accumulation of $CaCO_3$. This stage goes on simultaneously with (1) and is accompanied by soil formation. (3) Loess formation, in which weathering proceeds under a more arid and warmer climate than in (2), the absorbing complex becomes saturated with Ca and Mg, and aggregation occurs. (4) "Deloessification", in which the climate becomes more humid, leaching of carbonates occurs, Ca is replaced by H in the absorbing complex, and there is some destruction of aggregates.

[2131] 631.483
BLANCK, E. Verwitterung. **[Weathering.]** *Naturforsch. Med. Deutschland 1939-46*, Vol. 48, 1948 (83-88). [G.]

General conclusions are shortly presented of studies of the fossil and recent weathering of German granite, Bunter sandstone, gneiss, basalt and diabase and of the part of weathering in the formation of red earths on limestones and chalks of southern and western Germany.

631.5 CULTURAL OPERATIONS

(*See also* Abs. No. 2068)

[2132] 631.547.1 : 581.144.2
OSVALD, H. **Root exsudates and seed germination.** *Kgl. LantbrHögsk. Ann.* **16**, 1949 (789-796). [E.] [Inst. Pl. Husbandry]

Weak NH_4OH extracts and alcohol extracts from a *Festuca rubra* meadow soil depressed rape germination. About 50% of the seeds which did not germinate in the NH_4OH extract germinated after washing in distilled water. The toxic substance was inactivated or destroyed at 80-90°C. Arable-soil extract did not effect germination. Grass-root secretions absorbed by filter paper during 3 weeks' growth had a small effect on germination percentage of rape but a very obvious effect on the development of the rape-seedling roots. The competitive ability of many grass species, e.g., couch grass and red fescue, is apparently partly due to the effect of their root secretions.

631.58 AGRICULTURAL SYSTEMS

(*See also* Abs. No. 2378)

[2133] 631.582
LOIZIDES, P. A. **The cereal-fallow rotation in Cyprus.** *Comm. Bur. Soil Sci. Tech. Commun.* 46, 1949 (210-217). [Dept. Agric., Cyprus]

Cyprus soils are low in N and P and the effect of fallow is to increase the available N and P in the soil, but moisture is not conserved through the use of fallow. In an effort to extend the area under crops and to raise the productivity of the land it is suggested that the wheat-fallow rotation should be abandoned as it encourages erosion. The extensive use of fertilizers and the replacement of fallow by grazing and hay crops would provide for animal husbandry and increase productivity.

[2134] 631.584
CROCIONI, A. Ricerche sulla consociazione dell' erba medica. **[Researches on associations with lucerne.]** *Ann. Sper. Agrar. Roma* 3, 1949 (437-456). [I.] [Ist. Agron., Univ. Bologna]

With high humidity as a result of irrigation, competition among associated plants gradually diminishes and may disappear. With wheat, intense prolonged drought reduces growth of lucerne, but an association with spring forage oats was favourable. Rapid and luxuriant growth of lucerne contributes towards checking weed growth the following year.

[2135] 631.589 : 631.466.1
COHEN, C. **Fungi as indicators of soil conditions: Soil fungi from South Africa.** *Nature* 164, 1949 (408-409).

Four plots under grass on sandy soil, lacking organic matter and with pH about 4.5, were given different cultural treatments for seven years. The fungal flora was examined and classified and reflected the different treatments, leading to tentative conclusions that burning followed by light grazing is preferable to being followed by heavy grazing or by lack of grazing, and that burning is harmful but may be necessary in the absence of grazing.

631.6 RECLAMATION. DRAINAGE. IRRIGATION

(*See also* Abs. Nos. 2202, 2252, 2311, 2386, 2393, 2399)

[2136] 631.613
Cox, R. K. **Contour cultivation on the wheat farm.** *J. Soil Conserv. Serv. N.S.W.* 5, 1949 (145-150).

Various factors contributing to the success of contour cultivation are discussed, including the use of specially designed implements such as the Muirhead storm-trap device.

[2137] 631.613 : 551.48
Mirovchenko, F. K. **[The retention of torrent and thaw waters on fields by means of ridges.]** *Pochvovedenie* 1949 (484-487). [R.]

Ridges 50-60 cm. high were made with a plough across the direction of slopes at intervals of 12, 25 or 50 metres according to the steepness of the slope. Run-off along the bottom of the ridges was prevented by curving the ridge down the slope in a semicircle of 2 metres radius at every 20-30 metres. Complete retention of thaw water was obtained.

[2138] 631.62 : 631.432.3
Kirkham, D. **Reduction in seepage to soil underdrains resulting from their partial embedment in, or proximity to, an impervious substratum.** *Proc. Soil Sci. Soc. Amer. 1947*, 12, 1948 (54-59). [Iowa Agric. Expt. Sta., Ames]

A complex formula is derived on theoretical grounds for the quantity of water seeping into a unit length of soil underdrain per unit time when the drain is half embedded in an impervious layer underlying a uniform layer of soil extending to the soil surface. It is found that lowering the drain onto or into an impervious layer decreases the flow rate.

[2139] 631.62 : 631.432.3
Kidder, E. H.; Lytle, W. F. **Drainage investigations in the plastic till soils of northeastern Illinois.** *Agric. Engng.* 30, 1949 (384-386, 389). [S.C.S., U.S.D.A. and Ill. Agric. Expt. Sta., Urbana]

Benefits from tile drainage on silt loams, silty clay loams and silty clay indicate that considerable variation may exist in the permeability rates in the same soil type. Satisfactory surface drainage channels have been constructed on minimum grades of 0.5 feet/1000 feet.

[2140] 631.622
Cavanillas, L. Estaciones de lisímetros. **[Lysimetry stations.]** *Bol. Inst. Investig. Agron. Madrid* No. 20, 1949 (211-234). [Sp.e.f.] [Inst. Nac. Investig. Agron.]

Results of field-plot and lysimeter experiments on potatoes are compared. On the basis of probable yield, it is likely that lysimetric determinations will give figures sufficiently accurate to calculate not only the total water requirement of a crop but also its most advantageous distribution.

[2141] 631.67 : 551.5
Penman, H. L. **A general survey of meteorology in agriculture and an account of the physics of irrigation control.** *Quart. J. Roy. Met. Soc.* 75, 1949 (293-302). [Rothamsted]

The agricultural value of weather forecasting is discussed. The difficulty of expressing biological activity in suitable mathematical symbols for correlation with meteorological data is explained. An expression is derived for evaluating the amount of radiation used in evaporation, and the relative transpiration from grass-like crops under conditions of adequate water supply, and absence of colour change. The amount of irrigation theoretically necessary was calculated from weather-estimated soil moisture deficits and applied experimentally to sections of a sugar beet crop, the two remaining sections having (a) no irrigation, (b) irrigation at the owner's discretion. As was forecast before harvesting, crop yields proved practically independent of watering treatment because of natural rainfall sufficiency. Repetition of the experiment is planned owing to the need for more extreme weather conditions to test theoretical estimates.

[2142] 631.67 : 631.347.24
International Sugar Journal. **Overhead irrigation.** *Int. Sug. J.* 51, 1949 (238).

An account is given of a new overhead irrigation system demonstrated at the Agricultural Experiment Station, Puerto Rico. It is claimed that increased yields result from the use of $\frac{1}{3}$ of the water needed for furrow irrigation. Introduction of fertilizing salts into the water is a possibility.

[2143] 631.67 : 631.347.24 : 631.411.4
MUNTER, E. L. **Large capacity sprinkler irrigation.** *Agric. Engng.* 30, 1949 (339-340, 342). [Wm. Gehring Farms, Rensselaer, Ind.]

Irrigation systems used on potatoes, onions, etc., on muck soils are described.

[2144] 631.67 : 631.459
MECH, S. J. **Effect of slope and length of run on erosion under irrigation.** *Agric. Engng.* 30, 1949 (379-383, 389). [S.C.S., U.S.D.A.]

It is possible to have serious erosion in the upper parts of irrigated fields even when neither soil nor water is wasted on lower slopes. Any practice that increases infiltration requires an increase in the irrigating head. Increasing infiltration decreases the percentage of run-off, but increases the potential erosion hazard along the furrow. Reditching and otherwise disturbing the soil in the furrow increases erosion. Reducing the gradient by directing irrigation furrows across the slope increases both the rate of infiltration and the irrigating head; it reduces the amount of erosion only where there is an appreciable rate of run-off.

[2145] 631.671 : 581.192.6
EAST PUNJAB IRRIGATION RESEARCH INSTITUTE. **Quality of irrigation water.** *East Punjab Irrig. Res. Inst. Rept. 1947*, 1948 ? (14-15). Cent. Bd. Irrig. Abs. 107-108 (112).

Experiments are described involving irrigation waters of different composition to find their effects on the soil and on rice crops. The chief salts contained were NaCl, Na_2CO_3, Na_2SO_4 and mixtures of Na and Ca salts. The salt index of the water is claimed to be a criterion of its suitability.

631.8 FERTILIZERS

[2146] 631.81 : 631.416
MUKHANOVA, V. L. **[The effect of long-continued manuring on the agrochemical properties of serozems.]** *Pochvovedenie* 1949 (348-355). [R.]

Under a lucerne-cotton rotation serozems showed an increase in organic C and total N. Under continuous cotton loss of organic matter was less with fertilizers than without. Manure increased the organic and total N in a half-metre layer of an irrigated serozem. The nitrifying capacity was considerably increased by both mineral and organic manures, particularly in the rotation. Total and soluble P also increased in the arable horizon.

[2147] 631.81 : 631.421
CROWTHER, E. M. **Field experiments as the basis for planning fertilizer practice.** *Amer. Fert.* 3, No. 3, 1949 (9-11, 24, 26).

Interchange of results of research in different countries has been hindered by lack of standardization of method or of statistical presentation of results, as, e.g., the different details in evaluation of available P in fertilizers practised in the U.S. and in Britain, which led to rapid introduction of NH_4-super. in the former whereas in the latter extensive field experiments must precede its introduction.

The difficulties of fertilizer allocation and the statistical approach to the problem by Crowther and Yates are described. They showed that the most advantageous use of a restricted quantity of fertilizer is one in which rates for all crops fall by a constant (not proportionate) amount below the most profitable dressings for the given conditions. Standard responses are tabulated for the principal crops in the U.K. for specified conditions, and deviations produced by dung are described.

Surveys of current practices in fertilizing revealed some wastage, including failure to appreciate the value of farmyard manure in the newer arable areas of the wetter regions and a mistaken view of the general nutritive value of the humus of newly ploughed grassland which often lacks Ca and P. Similarly, analysis of pre-war German crop trials shows that national emphasis on K at the expense of P was wholly unjustified.

The advantages of the establishment of standard response tables for agricultural regions are indicated, especially in conjunction with soil analyses and foliar diagnoses.

A method is outlined for calculating standard responses by reference to the Law of Diminishing Returns, and critically compared with that used by Mitscherlich, whose implied extravagant claims for N fertilizers are misleading.

[2148] 631.81 : 631.557
GERICKE, S. Düngung und Ernte in Europa. **[Fertilizing and crop yields in Europe.]** *Z. PflErnähr. Düng.* 44, 1949 (47-64). [G.]

A study of the relationship between yields and consumption of fertilizers in 20 European countries. According to calculations based on the figures given by A. N. Gray (International Superphosphate Manufacturers' Association, London, 1938) the yields of wheat, potatoes and sugar beet are related primarily to the consumption of commercial N, P and K fertilizers while all other production factors are of secondary importance. P deficiency caused the greatest drop of yields (more than 150% as compared with N and K deficiency).

It is concluded that improved plant nutrition by the application of commercial fertilizers represents the most important production factor of European agriculture. —B.F.G.

[2149] 631.81 : 631.816.1
EHRENBERG, P. Zur Frage der Phosphorsäure- und Kalidüngung der ärmsten Böden. **[Phosphorus and potassium fertilization on the poorest soils.]** *Z. PflErnähr. Düng.* 44, 1949 (157-158). [G.]

Contrary to the view of Goy (*Ibid.* 43, 1949 (18-27)) the author maintains that farmers should apply the available quantities of fertilizers first to the better soils since the poorest soils usually require prior correction of their water and Ca status.—B.F.G.

631.811 PLANT NUTRITION

[2150] 631.811 : 631.414.3
ELGABALY, M. M.; WIKLANDER, L. **Donnan equilibria in plant nutrition. I. Effect of exchange capacity of clay minerals on the uptake of sodium and calcium by excised barley roots.** *Kgl. LantbrHögsk. Ann.* 16, 1949 (328-333). [E.] [Inst. Pedol., Uppsala]

The roots removed more adsorbed Ca and Na from bentonite than from kaolin, given equal concentrations and ratios of the two ions. When comparing the relative uptake as indicated by Ca/Na in roots, relatively more Ca and less Na were removed from kaolin than from bentonite. This is in accordance with the Donnan theory of membrane equilibria: the mineral with higher exchange capacity releases monovalent ions relatively more readily and divalent ions less readily than the mineral of lower exchange capacity.

[2151] 631.811 : 631.414.3
ELGABALY, M. M.; WIKLANDER, L. **Donnan equilibria in plant nutrition. II. Effect of acidoid content of plant on the uptake of sodium and calcium from bentonite suspensions.** *Kgl. LantbrHögsk. Ann.* 16, 1949 (334-338). [E.]

Pea roots showed a higher Ca/Na ratio than barley roots when placed in Na-Ca bentonite suspensions for 10 hours. The results accord qualitatively with the Donnan theory: the acidoid content and therefore the exchange capacity are higher in peas, which should therefore absorb relatively more of the divalent ion.

[2152] 631.811.2 : 539.16
MCAULIFFE, C.; PEECH, M. **Utilization by plants of phosphorus in farm manure. I. Labeling of phosphorus in sheep manure with P^{32}.** *Soil Sci.* 68, 1949 (179-183). [Cornell Univ.]

$KH_2P^*O_4$ was fed to some sheep and was used, as was radioactive super., for incubation of faeces from others. The P in the faeces was separated into inorganic, phospholipid, acid-soluble organic and protein-bound fractions and the degree of labelling determined for each. Labelling by feeding was found to affect 84-90% of organic P. Incubation with $KH_2P^*O_4$ labelled from 43-94% and with radioactive super. labelled 22-50% of organic P in different samples.

[2153] 631.811.2 : 631.414.3
MATTSON, S.; ERIKSSON, E.; VAHTRAS, K. ET AL. **Phosphate relationships of soil and plant. I. Membrane equilibria and phosphate uptake.** *Kgl. LantbrHögsk. Ann.* 16, 1949 (457-484). [E.]

The *actual* uptake of P_2O_5 by peas was increased by the addition to the soil of low concentrations (0.001-0.01 n.) of a neutral salt (K_2SO_4) and decreased by adding the salt in higher concentrations, but the *relative* uptake (P_2O_5 in plant/P_2O_5 in soil) increased throughout the salt-concentration range. The effect is explained on the basis of the Donnan distribution of ions.

[2154] 631.811.2 : 631.811.91
GERICKE, S. Beziehungen zwischen den Wachstumsfaktoren Wasser, Phosphorsäure und Kali. I. **[Relationships between the growth factors water, phosphorus and potassium. I.]** *Z. PflErnähr. Düng.* 44, 1949 (171-198). [G.]

A comprehensive report of the results of pot and field experiments carried out by the fertilizer industry. The effect of P was increased by improvement of the water conditions in pot experiments with oats and barley. While field experiments with oats, rye, wheat and potatoes showed an increased effect of P by increased water supply, barley and fodder beets failed to show this favourable effect. Up to 60 kg./ha. of P_2O_5 were utilized by fodder beet almost completely, even under dry conditions. The application of 60-120 kg./ha. necessitated bigger quantities of water. Sugar beet was able to use up to 90 kg./ha. completely under relatively dry conditions. A yearly precipitation of 500-600 mm. showed about the same yield increase of grass as did $>$ 800 mm. even with the highest P_2O_5 application (120 kg./ha.).

The effect of P fertilizing on the utilization of water by the crop plants was as follows: Equal quantities of water were better used by the plants when P was added to the KN fertilizer. The leaching out of K and N could be decreased by an additional P application. It is concluded that the presence of P will favour the better uptake of K and N and will decrease the leaching of these nutrients by higher precipitation quantities. —B.F.G.

[2155] 631.811.91
ATANASIU, N. Ein Beitrag zum Studium des Wasserverbrauchs unserer Kulturpflanzen. **A contribution to the study of water consumption of crop plants.]** *Z. PflErnähr. Düng.* 42, 1948 (103-123). [G.]

Determinations of water consumption of potatoes and spring wheat in cement vessels 1.15 m. deep and of surface 1 sq.m. using 6 different soils, and of transpiration and precipitation in 1947 showed that the water consumption of plants in the different soils was equal, in spite of yield variations of about 300%. The temporary water consumption of plants was found to be in accordance with Mitscherlich's plant-growth law. The "water consumption factor" (ratio of water consumption of plants to climatic transpiration) is related to the rhythm of plant growth and showed similar values in the different soils, but differences between potatoes and wheat were recorded. According to these results the water required for a vegetation period is given by the climatic transpiration multiplied by the "water consumption factor", minus the precipitation. —B.F.G.

[2156] 631.812
KREVELEN, D. W. VAN **Drying of fertilizer pellets in a rotary drier.** *Chem. Weekbl.* 45, 1949 (290-295). C.A. 43 (6351).

A solution of NH_4NO_3 is evaporated and mixed with marl to cut down the explosive hazard. The mixture is dried on a drum drier and scraped off in flakes which are passed through a rotary drier in which the heated air causes the flakes to soften and assume pellet form owing to tumbling.

631.816.32 FERTILIZER PLACEMENT

(*See also* Abs. Nos. 2183, 2184, 2335)

[2157] 631.816.32
COOKE, G. W. **Fertilizer placement.** *Fert. Soc. Proc.* 6, 1949, pp. 16. [Rothamsted]

The history and advantages of placement are reviewed. Placement methods for cereals, row crops (potatoes, peas and sugar beet) are discussed. Attention is drawn to the influence of the condition of the fertilizer on drillability and to the use of suitable placement machines.

[2158] 631.816.32
COOKE, G. W. **Recent developments in fertiliser placement.** *Farming* 3, 1949 (231-234, 243). [Rothamsted]

From numerous consistent results in southern and eastern England it is shown that, taking the efficiency of broadcasting potato fertilizer after ridging as 100, the average relative values of pre-ridging broadcasts, placement in contact with the seed, and placement in side bands are 69, 98 and 99 respectively. These values are subject to variation with weather; contact placement checks growth if dry weather ensues, and side-band placement may prove inferior to broadcasting in a wet season. With restricted

quantities of fertilizer the most profitable application method is placement in side bands or in the furrow bottom with a thin covering of soil, such procedure being particularly advantageous on fen peat liable to high P fixation and on calcareous soils poor in K.

Sugar beet, mangolds and swedes were seriously damaged in germination by contact placement of fertilizer even at low rates, but at 3 inches distance no harm resulted. With sugar beet, side-band placement gave no higher yield than did a worked-in pre-seeding broadcast, but early top growth was stimulated by the former. In a dry year swedes benefited substantially from side-band placement.

Peas were seriously damaged by placement in contact with, or close below, the seed, but side-band placement was highly beneficial. An early, deeply worked broadcast gave better results than one harrowed into the seedbed.

American experiments have shown that different application methods succeed according to the soil type, the crop and particularly the weather. Deep placement has often succeeded with widely-spaced crops, e.g., maize, and band placement by a subsoiler with fruit trees. Top-dressing bands have been profitably applied to annual crops in soils subject to rapid nutrient fixation or to leaching.

631.82 MINERAL AMENDMENTS

[2159] 631.821 : 664.12

GILLEY, G. R. **Treatment of New Red Sandstone soils.** *Brit. Sug. Beet Rev.* 17, 1949 (158).

The soils are very acid and lack humus. They are readily leached and ordinary lime dressings have only a transient effect A dressing of sugar-beet factory carbonate of lime, however, is effective for five years and also binds the soil into a crumby, moisture-retaining condition. It is important to incorporate the lime thoroughly and deeply. The soils can apparently take unlimited quantities of such lime without fear of overliming.

[2160] 631.821 : 669.16 : 631.417

KAPPEN, H.; HOFER, J.; GROHSE-BRAUCKMANN, E. Über die Wirkung des Hüttenkalkes auf die Zerstörung der organischen Stoffe des Bodens und über eine einfache Methode zu ihrer Bestimmung. **[The effect of blast-furnace slag on the destruction of soil organic matter, and a simple method of its determination.]** *Z. PflErnähr. Düng.* 44, 1949 (6-33). [G.]

A simple but useful method has been developed for the determination of CO_2 formed by the destruction of soil organic matter. Filter paper is impregnated with a 3 n. NaOH solution, free of CO_2, and suspended in a 1-litre bottle. The CO_2 evolved from a 200-g. soil sample is absorbed by the paper and the CO_2 content determined in a Scheibler apparatus. Application of different lime fertilizers on soils showed a much smaller CO_2 production with blast-furnace slag. The conserving effect of the slag on organic matter is caused by decreased growth of bacteria. The effect of blast-furnace slag on the physical and biological conditions of the soil, is, however, considered to be favourable.—B.F.G.

[2161] 631.821.1 : 546.27

DAVIS, F. L. **Effects of liming on response to minor elements of crimson clover, soybeans and alyce clover.** *Agron. J.* 41, 1949 (368-374).

B supplied to meet the needs of crimson clover often proves toxic to soybeans. Requirements of, and sensitivity to, B in plants is probably a Ca/B relationship, and formation of Ca borate in soils may account for the B deficiency which results from liming. Toxicity of B to soybeans appears to be corrected by soluble Ca or Mg rather than by rise of pH due to lime.

Alyce-clover yields were reduced by B and minor-element applications, regardless of lime. Where B, Cu, Mn and Zn were added to dolomitic lime at 1,500- and 3,000-lb. rates the toxic effects of the minor elements were markedly offset, but dolomitic lime was not superior to calcitic lime in correcting the effects on alyce clover of B alone.

Variations in minor-element requirements of these 3 legumes are greater than the effects of lime on soil deficiency of those elements in Norfolk loamy sand. Crimson clover showed a high response in seed yield

to applications of B, and slight responses to Cu, Zn and Mn. For all 3 crops dolomitic lime proved superior to calcitic lime when all 4 minor elements were added, and neither soybeans nor alyce clover require appreciable additions of minor elements on this soil. Alyce clover needs lime as well as PK. The optimum lime rate is 3,000 lb./acre without or 8,000 lb./acre with minor elements.

[2162] 631.821.1 : 632.192
GISIGER, L. Von den Ursachen der Überkalkungsschäden. **[The causes of injuries by overliming.]** *Z. PflErnähr. Düng.* 45, 1949 (54-71). [G.]

The availability and fixation of nutrients with heavy applications of lime are discussed. Experiments with oats showed a decrease of P availability on overliming of acid soils, but the yield depression was insignificant. It is not believed that overliming injuries are caused by high fixation of K when the soil is moderately well supplied with K. A satisfactory explanation for the injuries due to overliming is that swelling or even dissolution of plant colloids, e.g., in the root tips, is encouraged by OH ions. B weakens or prevents this effect. The uptake of Mn by plants is much higher in acid than in neutral or alkali soils but increases again in more alkali soils. The occurrence of grey speck in oats is favoured by moderate to heavy applications of B but very heavy applications (100 kg. and more of boric acid/ha.) prevent the disease.—B.F.G.

[2163] 631.824
BLAS, L. **Magnesium as a fertilizer.** *Ion* 9, 1949 (137-142). C.A. 43 (6774).

[2164] 631.824
LUNDBLAD, K. **Experiments on magnesium fertilization.** *Kgl. LantbrHögsk. Ann.* 16, 1949 (568-592). [E.] [Nat. Agron. Expt. Sta.]

The history of Mg fertilizing and of Mg-fertilizer experimentation in Sweden and the Mg content of Swedish vegetation are shortly surveyed. Mg deficiency is only a minor problem in Sweden, but its importance should increase with the progressive decrease in animal husbandry. Experiments of a pilot nature were done with potatoes in areas where the Mg content of vegetation is low. Basal NPK with or without manure was supplemented with 50-200 kg./ha. of $MgSO_4$ (5-20 kg. of Mg). 5 kg. of Mg appeared insufficient on deficient soils and there were indications (not statistically significant) that 20 kg. was too much. $MgSO_4$ was effective on deficient soils even with manure (a major source of Mg). It did not affect starch content of tubers. The Mg content of hay was a good indicator of soil deficiency, but soil analysis should give better information of fertilizer requirements. Ca content of hay, exchangeable K of soil, P_2O_5 content of soil and soil reaction gave no guide to soil-Mg requirement.

[2165] 631.828 : 539.16
BAETGE, H. H.; BEGEMANN, E. Düngungsversuche mit Plantoradon. **[Fertilizer experiments with Plantoradon.]** *Z. PflErnähr. Düng.* 44, 1949 (198-200). [G.]

Pot experiments with Plantoradon (a commercial supplement for fertilizers) on vegetables showed no significant yield increases, thus confirming previous results. See also *Soils and Fert.* XI [907, 908] and XII [1337].—B.F.G.

631.83 POTASSIUM FERTILIZERS

[2166] 631.83
KARST, H.; GRÜTZ, W. Feldversuche über die Wirkung verschiedenartiger Kalidüngemittel auf den Pflanzenertrag und Boden. **[The effect on yields and soil of different potassium fertilizers in field experiments.]** *Z. PflErnähr. Düng.* 44, 1949 (34-46). [G.]

Only a small effect was observed of different K fertilizers on winter rye and potato yields in loamy sand from 1936-47. No differences were found between kainite, potassium salts (40%) and K_2SO_4. Potassium magnesium sulphate showed higher yields than the other fertilizers. Although the available-potassium contents of the soil were far below the limiting values of Neubauer and Nehring, the field experiments showed only a low K requirement. No increase in soil acidity was observed due to the application of different K fertilizers.
—B.F.G.

[2167] 631.83 : 545
PERRIN, C. H. **Determination of potash in fertilizers.** *Anal. Chem.* 21, 1949 (984-986). [Canada Packers Ltd., Toronto]

A modification of the official method for determining K in fertilizers introduces a very rapid wet-combustion procedure operating simultaneously with the precipitation of K chloroplatinate, with simplification of apparatus and saving of time.

631.84 NITROGEN FERTILIZERS

[2168] 631.84 : 545
NASCIMENTO, A. C. Dosagem de azotos em adubos. **[Determination of nitrogen in fertilizers.]** *Rev. Agric. Piracicaba* 22, 1947 (11-12). Biol. Abs. 23 (1269). [Pt.]

Methods of making N determinations in fertilizers are given. Total N is divided into organic, NO_3 and NH_3 fractions.

[2169] 631.84 : 631 86/7
DHAR, N. R. **Fixation and loss of nitrogen and the source of soil nitrogen.** *Proc. Ind. Acad. Sci. India* 16A, 1947 (6-13).

$(NH_4)_2SO_4$ or NH_4NO_3 only improves crop production, but does not increase soil fertility and total N content of the soil. When 100 lb./acre of N are added as $(NH_4)_2SO_4$ almost 65 lb. are lost without benefit to soil or crop. Farmyard manure, leaves, molasses, hay, etc., fix atmospheric N and preserve the N compounds by functioning as negative catalysts in the processes of ammonification and nitrification. Farmyard manures have beneficial effect on soils for 30-40 years and legumes for only 5 years.

[2170] 631.841.8 : 631.671
DIJK, J. W. VAN **Experiments on the use of ammonia in irrigation water applied to rice.** *Meded. Alg. Proefsta. Landbouw* 70, 1948, pp. 18. [E.] [Inst. Soil Res., Buitenzorg, Java]

Application of NH_3 in rice irrigation proved uneconomic owing to variable, mainly high, losses from evaporation and from adsorption by the walls of earthen conduits.

[2171] 631.847.2
BJÄLFVE, G. **Inoculation trials of leguminous plants 1914-1948. Lucerne and clover trials.** *Kgl. LantbrHögsk. Ann.* 16, 1949 (603-617). [E.] [Inst. Microbiol., Leguminous Pl. Lab.]

The results are tabulated into 5-year periods and also by counties, with discussion for all reports received of farmers' trials, with and without inoculation. With lucerne (318 trials) the crop increase due to inoculation averaged 90%, the lowest increase being 15% and the highest 900%. In several cases a positive result was obtained where lucerne had grown before; in one such case the crop increase was 446%. One trial was negative (6% decrease) and 4 gave no positive result. With clover (873 trials) no negative results were obtained and 98% gave positive results, the recorded yield increases varying from 3 to 300%. In 32 trials where clover had been grown before, 29 gave increases of 3-100%.

[2172] 631.847.2
GELTSER, F. YU. **The significance of inoculation in raising yields of perennial herbage.** *Sovet. Agron.* No. 7, 1949 (59-69). [R.]

Given the right conditions, especially low acidity and the presence of available P, seed inoculation with both legume bacteria and azotobacter of perennial herbage can be very effective. Azotobacter inoculation was ineffective on cereal and other arable crops, and it is recommended that mixed inoculations of azotobacter and legume bacteria be given to the ley in the rotation.

[2173] 631.847.2 : 631.461.51
SCHMIDT, O. C. Zur Frage der Impfung mit Azotobacter. II. **[Inoculation with azotobacter. II.]** *Z. PflErnähr. Düng.* 42, 1948 (148-159). [G.]

Inoculation experiments with pure cultures of azotobacter and with a commercial inoculation preparation (AZ) on mustard, oats and flax in 1947 did not show significant yield increases. The experiments will be continued with other soils, as the reported good results by Russian research workers have been obtained partly in better soils, richer in humus.—B.F.G.

[2174] 631.847.2 : 631.461.51
JESSEN, W. Über die Wirkung von Impfpräparaten für Nichtleguminosen. **[The effect of inoculation preparations on non-legumes.]** *Z. PflErnähr. Düng.* 44, 1949 (206-208). [G.]

By seed inoculation with a commercial azotobacter preparation on a sandy loam soil (pH in KCl 7.5) receiving basal PK and 20 kg./ha. of N an increased yield of carrots (11%) was obtained. The effect with larger quantities of applied N was not tested. —B.F.G.

631.85 PHOSPHATE FERTILIZERS

(*See also* Abs. Nos. 2050, 2362)

[2175] 631.85
BAEYENS, J. **[New aspects of agricultural chemistry, nitrogenous and phosphatic fertilizers.]** *Agricultura* 47, 1949 (72-92). C.A. 43 (4803).

Experiments show that the penetration of different forms of phosphate in fine sand below 10 cm. even after 6 months is very small. The yield coefficient of a P fertilizer is the percentage of applied fertilizer assimilated by the first crop. In an open field the coefficient is 3-12%; in pots it is 10-30%. The difference is due to greater microbiological activity in pots. The coefficients vary with the type of soil, but are independent of the chemical form of the P fertilizer. Water percolated from pots contained 0.1-0.8% of the applied P fertilizer, depending on the climate; it is independent of the nature and amounts of applied fertilizer, but is specific for each type of soil. After cropping, the amount of assimilable P_2O_5 in the soil is greater than initially, and the amount of N is lower. The amount of P_2O_5 taken up by plants is 14-15 mg./100 g. and is constant; the amount of N is independent of the applied fertilizer, but depends on the type of soil and the extent of nitrification.

[2176] 631.85 : 631.411.2
WURSTEN, J. L. **Relative efficiency of some phosphate fertilizers on calcareous soils.** *Proc. Amer. Soc. Sug. Beet Tech.* 5, 1948 (308-315). C.A. 43 (6350).

When 100 lb./acre of a water-soluble phosphate is added to a calcareous soil its availability is reduced within 24 hours to 22-25 lb./acre, after which a relatively constant level of availability is maintained; the availability of autumn-applied phosphate is therefore about the same as spring-applied. The availability of citrate-soluble phosphate is much less, but it is eventually accessible to succeeding crops. The so-called P fixation in these soils is not as significant as in acid soils. Water-soluble phosphates are of most advantage as side dressings to growing crops.

[2177] 631.85 : 631.416.2
BLASER, R. E.; MCAULIFFE, C. **Utilization of phosphorus from various fertilizer materials: I. Orchard grass and ladino clover in New York.** *Soil Sci.* 68, 1949 (145-150). [Cornell Univ.]

The soil used was Mardin silt loam, with pH 5.3 and readily-soluble P_2O_5 content of 81 lb./acre, and the crop a mixture of orchard grass and ladino clover. Neither yield nor P_2O_5 content was related to the source of phosphate or the rate of application, but drilled application gave a higher clover yield than broadcasting. The uptake from super. was higher than Ca di-, tri- or meta-phosphates, and during early growth the metaphosphate was next in efficiency. Increase of broadcast rate from 50 to 100 lb./acre caused increased uptake from all 4 fertilizers, and with super. and metaphosphate uptake was higher from drilled than from broadcast application..

Ladino clover absorbed more than 20% of its P from fertilizers at all stages of growth tested. Orchard grass took a much smaller percentage except during early growth and, contrary to the clover, it absorbed more from broadcast than from drilled applications.

[2178] 631.85 : 631.416.2
HALL, N. S.; NELSON, W. L.; KRANTZ, B. A. ET AL. **Utilization of phosphorus from various fertilizer materials: II. Cotton and corn in North Carolina.** *Soil Sci.* 68, 1949 (151-156). [N.C. Agric. Expt. Sta. and U.S.D.A.]

Experiments were conducted on Norfolk sandy loam, with varying soil-P levels, cotton receiving 50 lb. and 100 lb./acre applications and maize 50 lb./acre of various P fertilizers. Ammoniated super. and $Ca_2H_2(PO_4)_2$ were tested on cotton, and super., $\alpha Ca_3(PO_4)_2$ and Ca metaphosphate were tested on both crops.

The lowest percentage of P taken up by cotton on low- or high-P soil was from $Ca_2H_2(PO_4)_2$. Percentages were derived in descending order from Ca metaphosphate, super. and $\alpha Ca_3(PO_4)_2$, results being similar on both soils and at both application rates. Maize derived the lowest percentage of its P from $\alpha Ca_3(PO_4)_2$.

[2179] 631.85 : 631.416.2
JACOB, W. C.; VAN MIDDELEM, C. H.; NELSON, W. L. ET AL. **Utilization of phosphorus by potatoes.** *Soil Sci.* 68, 1949 (113-120). [Cornell Univ. and N.C. Agric. Expt. Stas.]

In Long Island and N. Carolina, experiments with potatoes grown at different P levels on silt loam gave the following results: with increased application the utilization of fertilizer P increased. In low-P soils the uptake of fertilizer P was greater than in P-rich soil. Total uptake was greatly affected by soil-P level but the uptake from fertilizer was not markedly affected by it. In all cases very little (4.2-14.5%) of applied P was utilized.

[2180] 631.85 : 631.416.2
KRANTZ, B. A.; NELSON, W. L.; WELCH, C. D. ET AL. **A comparison of phosphorus utilization by crops.** *Soil Sci.* 68, 1949 (171-177). [N.C. Agric. Expt. Sta. and U.S.D.A.]

Uptake of P from soil and from fertilizers was compared in maize and cotton on Norfolk sandy loam, and in maize, potatoes and soybeans on Bladen silt loam. Two levels of soil P were used in each case.

Potatoes absorbed a relatively high percentage of applied P throughout their growth. The highest percentage was that absorbed by maize during early growth, but, as with soybeans, there was a marked decrease later. At both P levels, recovery of applied P by maize was similar to that by cotton. Total P absorption was higher in maize than in soybeans, and lower than either in potatoes, but for fertilizer P the descending order was potatoes, maize, soybeans. Cotton absorbed less fertilizer P than maize, also less total P. Crops on high-P soil of the Norfolk series were richer in P_2O_5 than those on the low-P soil. Potatoes gave a yield response throughout, but cotton and soybeans responded only on low-P soil.

[2181] 631.85 : 631.416.2
OLSEN, S. R.; GARDNER, R. **Utilization of phosphorus from various fertilizer materials: IV. Sugar beets, wheat, and barley in Colorado.** *Soil Sci.* 68, 1949 (163-169).

Experiments were conducted on two calcareous soils to compare the efficiency of super., Ca metaphosphate, $Ca_2H_2(PO_4)_2$ and $\alpha Ca_3(PO_4)_2$ as P carriers, and of various placements. Uptake of P was greatest from super. and least from $Ca_3(PO_4)_2$. With sugar beet, band placement proved more effective than rotiller placement where super. and Ca metaphosphate were concerned, but with the less soluble sources the reverse held. In general, 4-inch-deep placement was superior to more shallow placements. Super. and Ca metaphosphate produced yield responses in sugar beet and wheat.

[2182] 631.85 : 631.812
SCHUFFELEN, A. C. **[New phosphate fertilizers.]** *Chem. Weekbl.* 44, 1948 (238-239). B.A. BIII, 1949 (222). [Du.]

Details are given of the preparation of calcined phosphate, fused phosphate rock and metaphosphate as products containing a high percentage of available P_2O_5.

[2183] 631.85 : 631.816.32
NELSON, W. L.; KRANTZ, B. A.; WELCH, C. D. ET AL. **Utilization of phosphorus as affected by placement. II. Cotton and corn in North Carolina.** *Soil Sci.* 68, 1949 (137-144). [N.C. Agric. Expt. Sta. and U.S.D.A.]

Uptake by cotton of P from fertilizer was high in the early stages from seed-level placement and in late stages from placement at 10 inches from the seed. Soil-P level had a much more marked effect than placement; cotton on low-P soil absorbed twice as much fertilizer P as did that on high-P soil. Norfolk sandy loam was used in these experiments.

Fertilizer mixed in the row or placed with the seed gave increased uptake of applied P by maize during early growth.

With both crops, uptake from broadcast fertilizer was low, and although the various placements gave little if any differences in final yield, tracer technique showed that they influenced utilization of applied P.

[2184] 631.85 : 631.816.32
STANFORD, G.; NELSON, L. B. **Utilization of phosphorus as affected by placement. I. Corn in Iowa.** *Soil Sci.* 68, 1949 (129-135). [U.S.D.A. and Iowa Agric. Expt. Sta.]

Use of P^{32} in super. showed that P utilization from fertilizer was greater with placement at seed depth in single or double side bands than with a single band either above or 3 inches below the seed. Seed-level placement gave better early growth but did not raise final grain yield. Recovery of applied P by the crop varied greatly at different stages of growth and on different soils. The soils used were Clarion loam and Webster silty clay loam.

[2185] 631.851
SCHWARZ, O. Die Anwendung von weicherdigen Rohphosphaten auf Mineralböden. **[Application of soft raw phosphates on mineral soils.]** *Z. PflErnähr. Düng.* 44, 1949 (159-167). [G.]

Results of pot experiments with North-African raw phosphates on oats, mustard and *Festuca pratensis* in two soils (pH in KCl 5.55 and 7.04) poor in P. The fescue and oats could use the raw phosphates only on acid soils while on the neutral soil a depressive effect was observed. The yield of the fescue in acid soil with raw phosphates amounted to 85-90% of that with basic slag, but the harvested material had 1/3 less P_2O_5 content. Addition of acid peat to the fescue-pots increased the yields and the P-recovery of raw phosphate and the effect of basic slag was sometimes exceeded. Mustard showed a good recovery of raw phosphate on the acid as well as on the neutral soil but the yields decreased on the addition of acid peat. The application of raw phosphates is recommended primarily on acid grassland.—B.F.G.

[2186] 631.855 : 631.873
WALSH, T. **Kelp as a reverting material for superphosphate.** *Eire J. Dept. Agric.* 45, 1948 (51-64).

Experiments, confirmed by pot and field tests, showed that kelp brought about reversion of P_2O_5 in super. from the water-soluble to the citric-soluble form without loss of manurial value. The mixture provided K and in addition certain secondary and minor elements. It compared favourably with ordinary super. and with that reverted by serpentine, dolomite or $Ca(OH)_2$.

Reversion with kelp was increased by extending time of contact, by heating, by adding a small amount of $(NH_4)_2SO_4$ and by decreasing pH. With relatively large additions of $(NH_4)_2SO_4$, however, it decreased.

631.86/7 ORGANIC FERTILIZERS

(*See also* Abs. Nos. 2000, 2014, 2312)

[2187] 631.86/7
SWANSON, C. L. W. **Preparation and use of composts, night soil, green manures and unusual fertilizing materials in Japan.** *Agron. J.* 41, 1949 (275-282). [Agric. Exp. Sta., New Haven, Conn.]

The order of importance of organic manures used in Japan is: compost, night soil, green manures, miscellaneous substances, e.g., plant ashes, seaweed, animal manures and silkworm excrement. Accounts are given of the making of compost and the storage and use of night soil, including data on pathogenic organisms in the latter. The chemical analysis of a large number of manures is given, including the efficiency of their plant nutrients compared with that of inorganic fertilizers. The reported effect of atomic bombing on crop yields is probably due to soil partial sterilization and the addition of ashes to the soil.

Addition of red silty clay to 'iron-podzolized' rice soils has reduced brown spot and blast disease in crops. The use of dried or of burned soil in some districts has increased rice yield. Deposits and weeds from ponds, silkworm waste, NH_4-rich industrial well-water and bird guano are some of the locally used organic fertilizers. A number of natural minerals are being investigated for their P and K content. They include phosphosiderite and vivianite for P, and bittern (a by-product of salt extraction), alunite, liparite, glauconite, K-feldspar and green tuff for K. Bittern is the source of 'furikiri' (6% of K) and 'carnallite' (12% of K). The percentage of acid-soluble P in some minerals was markedly raised after incubation with S and oil.

[2188] 631.86/7 : 631.81
HUDIG, J. Het cyclus-bedrijf. **[The farming cycle.]** *Landbouwk. Tijdschr.* 61, 1949 (447-456). [Du.]

The ideal farming cycle is one in which all organic matter removed is replaced, but this is impossible unless waste material of town or industry is imported.

An analysis of how far organic wastes are available for composting on a 40 ha. farm in Holland is given as follows. There are 8 ha. of permanent pasture and 6 of sown pasture; stock carried is 25 mature cattle. It is estimated that such a farm requires 500 tons of compost per year. Ploughing-up and legume-growing will supply 65.5 tons leaving 434.5 tons in the form of manure and compost. 250 tons of manure is available from the stock (and litter), leaving 184.5 tons or 61.5 tons of dry matter to be provided by composting waste materials. If 83 tons of waste goes for litter there is a deficit of 51.5 tons of organic matter (dry matter). The problem lies between buying in fodder for more stock or buying industrial or town wastes for composting.

Apart from high labour costs in compost making the author considers that English conditions must be more favourable to composting than in Holland and that the benefits of composting over rational manuring, including the use of artificials, have still to be proved.—K.S.

[2189] 631.86/7 : 631.81
HUDIG, I. Die Grundlagen der Bodenbehandlung, hundert Jahre nach Liebigs chemischen Auffassungen. **[The fundamentals of soil management, a hundred years after Liebig's chemical interpretations.]** *Z. PflErnähr. Düng.* 45, 1949 (76-88). [G.]

The author presents a graphical scheme to explain the involved soil-plant processes, in which the biological buffer capacity of the anions is an important factor. The scheme exposes the shortcomings of the all-mineral and all-organic views of fertilizing and stresses the importance of structure and the return of farm and town waste to the soil.—B.F.G.

[2190] 631.86/7 : 631.85
VLASIUK, P. A.; DOBROTVORSKAIA, K. M. **[The effectiveness of enrichment of manure with mineral fertilizers.]** *Agrobiologia* 6, 1948 (109-123). C.A. 43 (5143). [R.]

Sugar-beet yield was increased by supplementing cattle manure with super., providing 45 kg. of N as $(NH_4)_2SO_4$, 45 kg. of K_2O and 30 kg. of H_3PO_4/ha. The mixture was composted for 6 months. Phosphorite meal was less effective than super. N content of the beet was raised at the expense of K and P levels by mineral fertilizers, but this was remedied by composting.

[2191] 631.86 : 631.811.2
KAILA, A. Karjanlannan fosforista. **[Phosphorus in farmyard manure.]** *Maat. Aikak.* 21, 1949 (67-82). [Fi.e.] [Agric. Res. Inst., Tikkurila]

The following method was used for fractionation of P in manure samples. Successive extractions at ratios 1/50 were made from air-dry samples, once with absolute ethanol and twice each with distilled water and n./2 HCl at room temperature. A modified Denigés calorimetric determination was made of total P from ash solutions and of inorganic P from water and acid extracts, data being collected for the following P fractions: phosphatide, inorganic, water-soluble and acid-soluble organic, and insoluble residue.

Ca content and pH, differing in manure from different animals, resulted in characteristic differences in the solubility of inorganic P. Mineralization of organic P was dependent on the C/P_2O_5 ratio, and only in horse manure was this favourable to biological absorption of P at the beginning of humification. Straw litter added to cattle manure did not cause appreciable biological absorption. Water-soluble and acid-soluble fractions were readily mineralized, especially under anaerobic conditions. Conversion of added super. into organic compounds was negligible. The inorganic-P content was higher in manure with peat than in that with straw. Soluble organic P was most abundant in poultry manure.

[2192] 631.86 : 631.812
IVERSEN, K.; DORPH-PETERSEN, K. Undersøgelser over Produktionen af Stalgødning og Ajle. **[Investigations on the production of solid and liquid farmyard manure.]** *Tidsskr. Planteavl* 52, 1949 (628-652). [Da.e.]

Experiments were made to determine the relations between the quantities of fodder fed to stall-fed cattle and the quantities of manure produced, as well as the proportions of the N, P and K fed that were obtained in the manure.

The amount of solid dung produced depended on the amount of fodder, particularly straw, and the amount of urine on the water consumed in the fodder. A mixture of grass and clover yields a large quantity of liquid manure with high N and K contents, but the P content of the solid manure is low. Autumn feeding with fresh beet tops produced large quantities of liquid manure with low N and K contents. Feeding with swedes gave a dung with a high P content. One cow produced annually 10 tons of solid and 5½ tons of liquid manure. 21% of the N fed, 24% of the P and 6% of the K were recovered in the milk, and 75, 73 and 90%, respectively, in the dung and urine of milch cows. 92, 92 and 100%, respectively, were recovered in the dung and urine of heifers.

[2193] 631.86 : 636.3 : 631.855
MCAULIFFE, C.; PEECH, M.; BRADFIELD, R. **Utilization by plants of phosphorus in farm manure: II. Availability to plants of organic and inorganic forms of phosphorus in sheep manure.** *Soil Sci.* 68, 1949 (185-195). [Cornell Univ.]

Mardin silt loam from a limed area was used in a greenhouse experiment to investigate the relative availability of sheep manure and super. as P sources. Italian ryegrass was the indicator crop, and radio-P was incorporated with the 2 fertilizers.

The P content of the grass rose markedly with successive cuttings, manure tending to give higher values than super., and mixing with soil was finally, but not initially, more effective than band placement. The proportion of fertilizer P in the total absorption decreased with time (except for protein-bound P). Availability of manure and super. was similar, but in early growth stages it was slightly higher for super.

Incubation of manure for 22 days slightly increased the availability of P, but incubation of mixed super. and manure had no effect. Recovery by the plants of applied P agreed strongly with the results of soil extraction (1% citric acid), and protein-bound P proved very low in availability. Isotopic exchange and biological conversion may affect P-activity in the plants and hence also the interpretation of results.

[2194] 631.871 : 636.086.25
LEMMERMANN, O.; GRÜTZ, W. Zur Frage der Strohdüngung. **[Fertilizing with straw.]** *Z. PflErnähr. Düng.* 44, 1949 (1-6). [G.]

Previous investigations showed that the application of straw decreased yields. Field experiments should prove whether the application of slightly rotted straw without N also causes this decrease in yield and whether the applied N fertilizer becomes fixed during the production of "artificial manure". After 6 days' fermentation, 10,000 kg./ha. of straw (C/N ratio about 125 : 1) were incorporated into the soil in autumn and 70 kg./ha. of N were applied to the plots in spring. An artificial manure (C/N ratio 20 : 1), prepared in autumn with the same quantities of straw and N, was applied in spring.

The potato yield with the slightly rotted straw was much higher than with the artificial manure. The yield of the plots with artificial manure was 21% less than with mineral fertilizers alone.—B.F.G.

[2195] 631.874 : 631.811.2
FULLER, W. H.; DEAN, L. A. **Utilization of phosphorus from green manures.** *Soil Sci.* 68, 1949 (197-202). [U.S.D.A.]

Greenhouse-grown ryegrass on low-P soil (Evesboro loamy sand) gained 50% of its P from green manure derived from wheat and soybeans, which supplied 70% of the amount supplied by an equivalent dressing of super. Green manure was more profitable when layered than when mixed with the soil. More P was absorbed from natural wheat tops than from those whose inorganic P had been extracted.

[2196] 631.875
VILJOEN, N. **Compost: Its preparation and uses.** *Farm. S. Africa* 24, 1949 (235-238). [Coll. Agric., Potchefstroom]

[2197] 631.876.9 : 634.8
KOTTER, E. **Modern economical utilization of wine residues and vine shoots.** *Mitt. Chem. Forsch.-Inst. Ind. Österr.* 2, 1948 (52-56). C.A. 43 (6360).

The profitable treatment of the mash and residues of wine production is discussed.

[2198] 631.878
BACAL, B. La turba, fuente de humus. **[Peat, a source of humus.]** *An. Soc. Cient. Argentina* 143, 1947 (239-246). [Sp.]

Because of its high natural acidity, peat needs special treatment before it can be used as part of a compost fertilizer. Various possible combinations are described. The land from which peat was extracted could be used for vegetable growing, etc.

[2199] 631.878
LINSER, H. Über die bodenverbessernde Wirkung von "humonisiertem" Torf. **[The soil-improving effect of "humonized" peat.]** *Bodenkultur* 3, 1949 (192-204). [G.] [Austrian Nitrate Works, Linz]

"Humon" or peat whose humic acids have been converted into water-soluble NH_4 salts (no details given) held 48% more water than peat of the same dry weight and passed 50 times as much humous material into water solution. A soil took up about 140 times as much humous material from the Humon solution as from a peat solution. 2-g. pellets of soil treated with an acqueous extract of Humon took 6-7 times as long to collapse in distilled water as those treated with peat solution. In fertilizer experiments with Humon and with peat fortified with equivalent N fertilizer Humon gave a considerably larger yield of potatoes.

[2200] 631.878 : 631.436
EVERSON, J. N.; WEAVER, J. B. **Effect of carbon black on properties of soils. Effect on soil temperatures.** *Indust. Engng. Chem.* 41, 1949 (1798-1801). [Univ. Mass., Amherst]

Temperature measurements were made for more than a year on a plot, part of which had been treated with 4000 lb./acre of carbon black. At the surface and 2 inches deep, addition of carbon increased maximum and minimum temperatures and so increased the time available for plant growth.

[2201] 631.878 : 631.812
GUYON, G. Solubilization d'acides humiques de la tourbe par compostage à la cianamide. **[Conversion of humic acids of peat into soluble products by composting with cyanamide.]** *C.R. Acad. Agric.* 35, 1949 (404-405). [F.]

To make successful peat compost, large quantities of cyanamide and some basic slag and K_2SO_4 are necessary; these are mixed, and layered alternately with the damp disintegrated peat. Some of the NH_3 generated is lost to the atmosphere, the rest acts on humic acids forming soluble products, but not in large or regular quantities. Thus the method proves costly for the amount of humic material converted, and manurial effects are largely due to the other ingredients.

[2202] 631.879.2 : 631.67
SKIBNIEWSKI, L. **Chemical problems in agricultural utilization of sewage.** *Gaz, Woda i Tech. Sanit.* 23, 1949 (52-54). C.A. 43 (5143).

Biologically purified sewage containing 50% N of compounds proved more advantageous than other forms of sewage for irrigation.

632 PLANT DISEASES. WEEDS AND PESTS

(*See also* Abs. Nos. 2162, 2229, 2248, 2376)

[2203] 632.191
WARTENBERG, H. Das Chloroseproblem. **[Chlorosis.]** *Festschr. Fünfzigjähr. Best. Biol. Zentralanst. Berlin* 1949 (179-187). [G.]

A review of the development of knowledge concerning chlorosis.

[2204] 632.191 : 546.47 : 546.56
RICEMAN, D. S. **Mineral deficiency in plants on the soils of the Ninety-mile Plain in South Australia. 5. Effect of growth and removal of a crop treated with zinc and copper upon pasture established subsequently on Laffer sand near Keith.** *Aust. J. Counc. Sci. Indust. Res.* 21, 1948 (229-235).

After cropping virgin soil with cereals and roots or peas grown with Zn, Cu and super., pasture was established on the cropped land as successfully as on identically ferti-

lized plots of fallow. Lucerne in the pasture made poor growth when the preceding crop or fallow received only 1½ cwt./acre of super., and low yields of subterranean clover and *Phalaris* were produced in the seeding year. Fallowed soil gave similar results to cropped soil. In the second year, subterranean-clover yield greatly improved, maintaining its status in the two following years. *Phalaris* improved in the third year and remained vigorous. A second Zn and Cu application was without result; the residual effects of the original dressing proved adequate.

[2205] 632.2 : 632.953
CLAYTON, C. N.; ELLIS, D. E. **Soil treatments with chloropicrin, D-D and Uramon for control of root-knot nematode.** *Phytopath.* 39, 1949 (583-589). [Agric. Exp. Sta., Raleigh, N.C.]

On sandy loam with high nematode population, chloropicrin was applied at 400 lb./acre, D-D at 200, 400 and 600 lb./acre and Uramon at 2420 and 4840 lb./acre. Some plots were treated in March, some in July and the rest in October, 1946. The 1947 crops were tomatoes and snap beans, followed in 1948 by cantaloupes. Root-knot was more effectively reduced in the latter treated plots, and by the higher applications of nematocides. Tomato yield was increased in all cases but bean crops suffered from toxic or other deleterious effects of all 3 substances, especially when applied only 7 months before planting. Residual benefit was obtained by the cantaloupe crop from the previous year's root-knot reduction.

[2206] 632.2 : 632.953
ELLIS, D. E.; CLAYTON, C. N.; OWENS, R. G. **Effects of soil treatments with Uramon and certain fumigants upon plant growth and incidence of root-knot.** *Phytopath.* 39, 1949 (590-597). [Agric. Exp. Sta., Raleigh, N.C.]

Reduction of root-knot and increase of crop yield were obtained by treating soil with Uramon, chloropicrin, D-D, ethylene dibromide or ethylene chlorobromide. Uramon at ¼ lb./sq. yd., applied in autumn, gave increased yields in spring-planted crops, its deleterious effects being counteracted in some cases by addition of peanut-hull meal, cottonseed meal, manure, or a rye cover crop.

Snap bean was not injured by ethylene dibromide at 200-600 lb./acre in autumn or spring or by D-D or chloropicrin at 200-400 lb./acre in autumn or chloropicrin at 200 lb./acre in spring, but heavier applications of these two had adverse effects.

[2207] 632.537.4 : 632.954 : 577.17
JACKMAN, G. R.; TINCKER, M. A. H. **The use of a selective weed killer in nursery gardens. The control of horsetail.** (***Equisetum arvense***). *J. Roy. Hort. Soc.* 74, 1949 (351-355).

One application of 6 oz./sq. yard of Agroxone as powder in May after rain killed top growth of horsetail and very little new growth took place that year. The ground should be left undisturbed by cultivation for some weeks after application. To eradicate the weed Agroxone should be applied for at least 3 successive years to exhaust the underground tissues. A list is given of cultivated plants and weeds that were not damaged by Agroxone. Seedlings of coniferous and some broad-leaved trees grew well through the treated soil.

[2208] 632.556.7 : 632.954 : 577.17
MERCER, A. D. **Control of water hyacinth** (***Eichhornia crassipes***) **in the Rewa delta.** *Fiji Agric. J.* 19, 1948 (72-73).

A first spraying with 1½% Weedone reduced water hyacinth by 75%. A second spraying was done 10-40 days later.

[2209] 632.556.7 : 632.954 : 577.17
HITCHCOCK, A. E.; ZIMMERMAN, P. W.; KIRKPATRICK, H., JR., ET AL. **Water hyacinth: its growth, reproduction, and practical control by 2,4-D.** *Boyce Thompson Inst. Contr.* 15, 1949 (363-401). [Tulane Univ., New Orleans, La.]

Killing of *Eichhornia crassipes* Solms. was effective with concentrations of 0.3% or higher of 2,4-D, with rates of application of 2 lb./acre or more and with rate of delivery of 6-150 gall./acre. A higher dose of 2,4-D and a longer time after treatment were required to cause hyacinths to sink than to kill them. The isopropyl and butyl esters were as effective as the alkanolamine salt. The isopropyl ester and alkanolamine salt of 2,4,5-T were less effective than 2,4-D. No non-hormone toxicants, except possibly sodium trichloroacetate, caused additive effects when used with 2,4-D. 2,4 D at

rates of 2-8 lb./acre did not kill alligator weed (*Alternanthera philoxeroides* [Mart] Griseb). The isopropyl ester of 2,4,5-T killed and sank alligator weed but was effective against hyacinth only when used in excess of 8 lb./acre. The trichloroester killed and sank alligator weed; the alkanolamine salt caused killing but little sinking.

[2210] 632.573.7 : 632.954
NAMBIER, R. R.; SAHADEVAN, P. C. **The sensitive plant as a weed and its control.** *Madras Agric. J.* 35, 1948 (233 235). Biol. Abs. 23 (1259).

Mimosa pudica can be controlled by 3% Na-arsenate spray.

[2211] 632.645 : 631.416
RODRIGUEZ, J. G.; NEISWANDER, R. B. **Effect of soil-soluble salts and cultural practices on mite populations on hothouse tomatoes.** *J. Econ. Ent.* 42, 1949 (56-59). C.A. 43 (5892).

The first year a positive correlation was found between soluble salt and mite population. In the subsequent 2 years this relationship was not evident. Mite population and specific conductivity of the soil decreased over the 3-year period owing apparently to decreased application of fertilizer.

[2212] 632.652 : 635.98
MARTIN, C. H. **Movement and seasonal populations of the garden centipede in greenhouse soil.** *J. Econ. Ent.* 41, 1948 (707-715).

Symphylids were found to move between soil particles where these were sufficiently coarse, and in fissures and cleavage planes. They were less abundant in the top 6 inches than at deeper levels, except in soaked soil and where population was very high. Distribution of adults was thought to be largely determined by movements of nymphs.

[2213] 632.654 : 631.81
GARMAN, P.; KENNEDY, B. H. **Effect of soil fertilization on the rate of reproduction of the two-spotted spider mite.** *J. Econ. Ent.* 42, 1949 (157-158).

Experiments with fertilized soil and with sand cultures showed that infestations of mites were considerably higher on plants grown with fertilizers than on those without.

[2214] 632.7 : 631.582
CHAMBERLIN, T. R.; FLUKE, C. L. **White grubs in cereal and forage crops and their control.** *Wis. Agric. Expt. Sta. Res. Bull.* 159, 1947, pp. 15.

The use of resistant crops such as sweet clover and lucerne in rotation with susceptible crops like bluegrass, timothy and maize is a suggested method of control of *Phyllophaga tristis*. Ordinary spring or autumn ploughing is of little value for control. Shallow ploughing followed by thorough discing while most of the grubs are feeding near the soil surface is helpful.

[2215] 632.765
THOMAS, I. **Recent research on wireworms.** *Agriculture* 56, 1949 (221-228). [Pl. Pathol. Lab., Harpenden]

Methods of estimating wireworm populations, laboratory and field studies, and chemical control are discussed. Gammexane is recommended for control, but should not be used on soils to be cropped in the same year or in the two following years with potatoes, onions or root vegetables for human consumption, as there is a risk that the flavour may be affected.

632.95 INSECTICIDES. FUNGICIDES. HERBICIDES

(*See also* Abs. Nos. 2205, 2233, 2259)

[2216] 632.951
SCHREAD, J. C. **Control of soil insects.** *J. Econ. Ent.* 41, 1948 (318-324). Biol. Abs. 23 (954). [Agric. Expt. Sta., New Haven, Conn.]

16 and 24 lb./acre of toxaphene gave better results during the first season against Japanese-beetle (*Popillia japonica*) grubs than did DDT. 10 lb./acre of chlordan killed more than twice as many grubs in 2 weeks as did 25 lb. of DDT. Parathion at 1 lb./acre was more effective than DDT, and 8 lb. of parathion was more effective than an equal dose of chlordan or of benzene hexachloride. Chlordan eliminated *Lasius niger* and the mound-building ant *Formica exsectoides* from turf.

[2217] 632.951 : 581.48
HENSILL, G. S. **Protection of growing plants from soil insects by use of insecticides on seeds.** *Agric. Chem.* 4, No. 1, 1949 (29-30).

The use of the gamma isomer of hexachlorocyclohexane at the rate of 2-3 oz./100 lb. of seed of beans, sugar beet, maize, peas, wheat and barley, and experiments with "Isotex" for seed treatment for the control of wireworms are discussed.

[2218] 632.951 : 631.811.2
WOLFENBARGER, D. O. **Nutritional value of phosphatic insecticides.** *J. Econ. Ent.* 41, 1948 (818-819).

Increased yields from potato plots sprayed with the phosphatic insecticides parathion, tetraethyl pyrophosphate and "Vapotone" were apparently due in part to the nutritional value of the insecticides, possibly utilized through the leaves.

[2219] 632.954
MCCALL, G. L.; ZAHNLEY, J. W. **Control of noxious perennial grasses with the trichloroacetates.** *Kans. Agric. Expt. Sta. Circ.* 255, 1949 (1-8). Biol. Abs. 23 (1259).

Trichloroacetates sprayed at 80-150 lb./acre gave complete control of quackgrass, Bermuda grass, Johnson grass, *Muhlenbergia* spp., gama grass, bluegrass and buffalo grass. Shallow-rooted grasses were controlled most successfully by applying TCA to the sod after removing top growth, and deep-rooted spp. by foliage applications. Annual grasses were controlled by 20-80 lb./acre as foliage spray. Growth-inhibiting effects persist in the soil for 30-90 days. Prickly pear was eliminated by spraying to the point of run-off with a solution of 0.5 lb./gal. of water.

[2220] 632.954 : 577.17
LAGAUDE, V. Désherbages sélectifs en Aveyron. **[Selective weedkillers in Aveyron.]** *Prog. Agric. Vitic.* 128, 1947 (315-319). Biol. Abs. 23 (1259). [F.]

Herbogil, Céréox, Agroxone, Herbol and Ermone are described briefly and their effectiveness against several plants compared.

[2221] 632.954 : 577.17
ESPINO, R. B. **Effects of 2,4-D on some common plants.** *Philipp. Agricst.* 32, 1948 (21-30).

2,4-D solution applied to 16 common weed or crop plants at the rate of 2.3 g. of powder to 1 l. of solution killed *Phaseolus lunatus* and the garden weed *Synedrella nodiflora* and one of 2 groups of *Amaranthus spinosus*. The weeds *Elephantopus scaber*, *Mimosa invisa* and the crop plant *Momordica charantia* (ampalaya) recovered from wilting. The solution was rather harmful to *Manihot utilissima* but had no effect on Gramineae.

[2222] 632.954 : 577.17
ÅBERG, E. **Effect of hormone derivatives on weeds and cultivated plants.** *Kgl. LantbrHögsk. Ann.* 16, 1949 (695-710). [E.]

A review of Swedish work from 1946 to 1948 on 4K-2M substances, 2,4-D esters and other 2,4-D substances.

[2223] 632.954 : 577.17
LEONE, I. A.; BRENNAN, E. **Response of several economically important plants to sodium salt of 2,4-D.** *Agric. Chem.* 4, No. 1, 1949 (40-43, 82-85).

Bean plants receiving root applications of 2,4-D were affected by all concentrations above 0.5 p.p.m. Action was rapid and all leaf and flower primordia were killed. The root was not affected. In maize, root treatment caused wilting in 2-5 days. Wilting occurred in soybeans and kidney beans with concentrations of more than 0.6 p.p.m.

633.1 CEREALS

(*See also* Abs. Nos. 2133, 2170, 2340, 2350, 2397)

[2224] 633.11-1.58
BELOZEROVA, N. A. **[Experiments with winter wheat in the Omsk regions.]** *Agrobiologia* No. 3, 1949 (142-159). [R.] [Siberian Sci. Inst. Grain Culture, Omsk]

It has been found possible to produce good crops of winter wheat where it has hitherto been considered impossible, by sowing in September directly into the stubble of a preceding crop of fertilized spring wheat. The ground was cross-disced, and sown in

August-September. Usually about 90% of the plants survived the winter, survival being very high even with frost-sensitive varieties. The snow cover was deeper and persisted longer on stubble-sown than on bare-fallowed fields, but according to Lysenko (who first proposed the method) the main reason for the success of stubble-sowing is that the soil on stubble fields is in excellent structural condition which protects the seeds and seedlings from damage by ice pressure. It is advisable to apply granulated super. at sowing and ammonium sulphate as a top-dressing in the spring.

[2225] 633.11-1.81 : 581.192
PETROSINI, G.; LEONE, G. **[Fertilizing of wheat varieties and their nutritive value.]** *Quaderni Nutriz.* 10, 1948 (302-319). C.A. 43 (5524). [I.]

Chemical compositions of wheat crops are tabulated as results of 4 years' experiments in Southern Italy. Fertilizers did not affect N content, but high yield was linked with reduced mineral content, especially in the case of P.

[2226] 633.11-2.51-1.581
FOZDAR, B. S.; SINGH, S. N. **Weed population of manurial and non-manurial wheat fields.** *Allahabad Farmer* 22, 1948 (451-455).

Weed populations were compared in two fields, one with a wheat-bare fallow rotation, unmanured for 25 years, the other with a green manure alternating with wheat. The weed population in the latter was much more dense, although less varied, than in the former.

[2227] 633.13-1.584 : 635.656
BACHER, I. Blandsäd av havre och ärt. Resultat av försök med ärtblandsäd, utförda under åren 1936-1943. **[Mixed crops of oats and peas. Results of experiments with mixed crops of oats and peas during 1936-1943].** *LantbrHögsk. Jordbr-Försöksanst. Medd.* 28, 1949, pp. 80. [Sw.e.]

Where peas alone gave a high yield, a mixed crop with peas predominating gave a higher yield than a mixed crop with oats predominating. The yield of mixed oats and peas was higher than that of oats and peas grown separately. The crude-protein content of peas was lower in the mixed crop, but the protein content of oat grain increased with an increase of peas in the mixture. A mixture of 75 kg./ha. of peas and 135 kg./ha. of oats is recommended.

[2228] 633.14-1.416 : 581.192
WYND, F. L.; NOGGLE, G. R. **Chemical composition of rye grown on different soil types in Ontario, Canada. I. Nitrogen content of the plants.** *Lloydia* 12, 1949 (30-40). [Michigan St. Coll., East Lansing]

Chemical analysis for N content of immature rye grown on five very different Ontario soils and cut just before jointing, was carried out in conjunction with soil analyses. The amount of organic matter in the soils, and properties quantitatively related to it, viz., N content, base-exchange capacity, total replaceable bases, replaceable Ca and fraction-3 P (i.e., that fraction of soil P that is positively related to the organic matter-replaceable base complex) showed a positive relationship to the percentage of N in the crops. These properties also varied concomitantly, hence detection of the most influential was difficult, but probably N content was the most significant.

In this vicinity (Wallaceburg, Ont.) the best soils for production of high-protein grass proved to be calcareous ones saturated with bases, and their relative suitability appeared to be determined by N percentage and base-exchange capacity.

[2229] 633.16 : 581.144.2
HESS, N. Beobachtungen über das Wurzelsystem bei Wintergerste. **[Observations on the root system of winter barley.]** *Bodenkultur* 3, 1949 (211-214). [G.]

In small-scale experiments in which the observations were in one plane only, through glass, the breadth of the root system was clearly related positively with frost resistance. The importance is stressed, for plant selection for breeding, of experimentation attempting to relate root forms to desirable hereditary characters.

[2230] 633.18-1.5
FERREIRA, J. C., JR. Aspectos da cultura do arroz. **[Aspects of rice cultivation.]** *Agronomia, Rio de J.* 7, 1948 (89-96). F.C. Abs. 2 (104). [Pt.] [Esc. Nac. Agron., Univ. Rur., Rio de Janeiro]

Four methods of rice cultivation are briefly outlined, applicable to different topographic and climatic conditions.

[2231] 633.18-1.517

MUKHERJEE, S. K. **Mechanized rice cultivation in the U.S.A.** *Indian Farm.* 10, 1949 (178-179).

Water for irrigation is diverted from streams and distributed in surface canals. Seed beds are levelled by ploughing, discing and harrowing by tractors with steel wheels. No transplanted rice is grown in U.S.A. as there is little advantage in transplanting and no suitable machine has been designed for the purpose. Seed is sown from aeroplanes flying about 10 feet above the flooded fields holding 2-4 inches of water. Water is raised to 4-8 inches as the seedlings grow. Fertilizer is broadcast from the air 3-4 weeks after sowing and 2,4-D is sprayed from the air for weed control. Rice is harvested and threshed by combines using tracklayers, but the paddy must be dried artificially before storing and milling. Rice is grown every third or fourth year in the same field and is rotated with pasture for cattle and soybeans.

[2232] 633.18-1.81

S., R. **Some results of research on rice.** *Indian Farm.* 10, 1949 (162-163).

$(NH_4)_2SO_4$ applied alone to rice at Dacca gave no appreciable yield increase, but in conjunction with lime the increase was significant. At two other centres $(NH_4)_2SO_4$ was equally effective with or without lime. In Kashmir 6% and 18% yield increases resulted from the use of $(NH_4)_2SO_4$ at 30 lb. and 60 lb./ acre of N respectively, and 5% and 6% increases from K_2SO_4 at presumably 60 and 80 lb./acre of K_2O respectively. (The original gives 60% and 80% per acre). Manure in conjunction with $(NH_4)_2SO_4$ was more effective than manure alone. Rape oilcake gave good results, but was not profitable financially. Farmyard manure at 180 lb./acre of N gave 29% higher yield than at 60 lb./acre.

[2233] 633.18-2.954 : 577.17

NAUNDORF, G.; VILLAMIL, G. F. Poder selectivo del 2,4-D. Contribución a la lucha contra el arroz rojo. [**Selectivity of 2,4-D. Contribution to the campaign against red rice.**] *Notas Agronomicas* 2, 1949 (70-81). [Sp.e.] [Esta. Agric. Expt. Palmira, Colombia]

A preliminary report is given on the possibilities of eradicating red rice from fields of white rice by the use of 2,4-D.

633.2/3 GRASSES. LEGUMES

(*See also* Abs. Nos. 2070, 2108, 2161, 2171, 2372, 2393)

[2234] 633.2.03 : 546.47 : 546.56

RICEMAN, D. S. **Mineral deficiency in plants on soils of the Ninety-mile Plain in South Australia. 6. Comparison of methods of establishment of mixed pasture sown with zinc and copper on Laffer sand near Keith.** *Aust. J. Counc. Sci. Indust. Res.* 21, 1948 (236-246).

Newly cleared Laffer sand was sown with a mixture of subterranean clover, *Phalaris*, lucerne, barrel- and burr-medick and cluster clover (a) without and (b) with a cover crop of oats, also (c) following an oat crop and (d) on one-year fallow soil. Super., Zn and Cu were applied with the pasture seeds except in (c) where they were applied at the oats seeding. In (a) (b) and (c) super. was repeated in the second year.

Subterranean clover was successfully established in all cases. The presence of a cover crop reduced its yield in the first year and exerted a transient residual increasing effect in the second year. On oat stubble it gave a higher yield than on fallow.

Phalaris was established more slowly, but by the third year was growing well in all four sowings. It was initially retarded by the cover crop, and by the previous oat crop.

Lucerne was poorly established throughout, being especially reduced by the cover crop. Medicks and cluster clover gave the poorest results, especially on oats stubble, and practically disappeared after one year.

[2235] 633.2.03-1.582

MARTIN, W. S. **Freedom from want.** *Farm. Week. S. Africa*, May 18, 1949, pp. 4.

The dangers, in the tropics, of continuous cultivation leading to soil erosion are pointed out, and the importance of including a ley in the rotation as a means of restoring soil structure and resistance to erosion is emphasised. For plant growth the root environment is as important as the nutrient supply, and it is suggested that the initials WAR (Water, Air, Root-room) should be as significant and as familiar to the farmer as NPK. Satisfactory conditions of water and air supply and root room can be obtained only in a soil with a stable crumb structure which

can be made by a grass ley. The introduction of grass into a system of husbandry necessarily involves the use of more stock.

[2236] 633.2.03-1.582-1.855

RETVEDT, K. Forrådsgjødslingsforsøk med superfosfat i gjenleggsåret. **[Field experiments with heavy dressings of superphosphate in the year of laying down to grass.]** *Meld. Norg. LandbrHøgsk.* 29, 1949 (75-122). [N.e.]

A single heavy dressing of super. in the seeding year of a grass ley proved equal, and in some cases superior, to application of the same quantity in 4 annual dressings, and was more beneficial at 480 kg./ha. than at twice that rate. Curves giving increase of yield for increase of super. on soil poor in P have an S shape. No correlation appears between P dressings and the proportion of clover to timothy in the hay. Timothy showed rather lower P content from an initial heavy super. dressing than from smaller annual applications but with clover the reverse was apparent, and the P content less affected by differences in application. These investigations do not cover calcareous or very acid soils.

[2237] 633.2.03-1.81

GROOT, H. DE De bemesting van grasland. **[Fertilizing grassland.]** *Maandbl. LandbVoorlD.* 6, 1949 (337-344). [Du.]

Presentation of some practical aspects of fertilizing grasslands and recommendation of amounts of P and K appropriate to different types of pastures. Where the soils are not deficient in P or K 20-30 and 150 lb. of P_2O_5 and 20-30 and 360 lb. of K_2O/acre per annum are recommended for grazing only and hay meadows only, respectively. —S.G.H.

[2238] 633.2.03-1.81

ZIFFER, A. Versuche zur Wiesendüngung. **[Fertilizer trials on meadow land.]** *Z. PflErnähr. Düng.* 44, 1949 (136-157). [G.]

Numerous manuring trials during 1924-44 gave the following main results: under different conditions the average yield of 1 kg. of applied N was 30 kg. of hay (3232 determinations); application of 100 kg. of a N fertilizer (20% N) to 5 ha. increased the fodder yield in such a manner that about 0.4 ha. of grassland could be saved for cropping purposes; all kinds of N fertilizers gave approximately the same effect, except calcium cyanamide which gave a rather smaller effect. During a period of 5 years on the average of 7 trials no falling-off in the effect of N was observed. The effect of fertilizer-N on mineral soils was improved by the application of organic manure.—B.F.G.

[2239] 633.2.03-1.84 : 581.192

HOLMES, W. **The intensive production of herbage for crop-drying. Part 2. A study of the effect of massive dressings of nitrogenous fertilizer and of the time of their application on the yield, chemical and botanical composition of two grass leys.** *J. Agric. Sci.* 39, 1949 (128-141). [Hannah Dairy Res. Inst., Kirkhill, Ayr]

A 1-year Italian-ryegrass ley and an established ryegrass pasture were given nine manurial treatments comprising applications from 0 to 312 lb. of N, 135 lb. of P_2O_5 and 168 lb. of K_2O/acre in one season. The effects of one or more massive dressings were compared with those of more frequent light dressings.

Dry matter in the yield was increased by the treatments up to twice the control and crude protein to three times. The latter was highest for massive spring applications of N. Both crude-protein and carotene content increased in later-cut herbage, and these two factors showed high correlation. The carotene/protein ratio rose with advance of the season, but the normal ratio broke down in Italian ryegrass where massive N dressings were given in spring. Ca and P content of the heavily manured herbage was not abnormally low and both were higher in autumn than in spring. Massive dressings tended to increase recovery of N by the grasses, and also benefited ryegrass and cocksfoot at the expense of poorer grasses, clovers and weeds.

[2240] 633.2.03-1.86/7

GISIGER, L. Die organische Düngung des Grünlandes. **[The organic manuring of grassland.]** Repr. *Proc. Fifth. Internat. Grassland Congr.*, 1949 (2-1—2-17). [G.e.]

A review, mainly reflecting Swiss conditions, with sections on the humus content of soil and its C/N ratio, the composition and effect of liquid fermented manure (*Gülle*) possessing various ratios of faecal matter

to urine, the effect of fermented urine with or without added straw, sawdust, etc., and applied on the soil surface or worked in, the comparative effects of N in the liquid manures and inorganic manures and the farmyard manuring and composting of meadows. The effect of organic manures including town wastes on grassland depends mainly on their content of the main nutrients and the availability of the latter. Urine-N has about the same effect as the NH_3-N of fertilizers and about 3 times that of dung-N. Organic matter spread on the soil seldom reduces yields and may even fix N from the air. The P_2O_5 and K_2O of dung and fertilizer are of similar effectiveness.

[2241] 633.3-1.85
MERCER, A. D. **Improving soil fertility by indirect nitrogenous manuring.** *Fiji Agric. J.* 19, 1948 (69-71).

The cheapest method of supplying N is by stimulating the growth of legumes with P fertilizer, preceded by a dressing of lime. On pasture 3-4 cwt./acre of phosphate should be applied annually for 3 years in April-May. On arable land, P should be applied at the same rate to a legume for ploughing in or feeding off.

633.4 ROOT CROPS

(*See also* Abs. Nos. 2179, 2394)

[2242] 633.4-1.516
RUSSELL, E. W. **Why must root crops be hoed ?** *Rhod. Agric. J.* 46, 1949 (166-171).

Field experiments have shown the value of hoeing young crops, especially if weeds are heavy or N is restricted. No reduction of evaporation was demonstrated. The hoe should not penetrate deeper than is necessary to kill weeds.

[2243] 633.42 : 546.27 : 638.16
HASLER, A.; MAURIZIO, A. Die Wirkung von Bor auf Samenansatz und Nektarsekretion bei Raps (*Brassica Napus L.*). **[The effect of boron on seed yield and nectar secretion in rape (*Brassica Napus L.*).]** Repr. *Phytopath. Z.* 15, 1947 [?] (193-207). [G.e.f.]

In pot experiments on the frequent sterility of apparently normal cruciferous plants, using rape in a basally manured slightly humous sandy loam of pH 5.9, B had no effect on the amount and sugar concentration of the nectar or on the yield of straw, but was indispensable for seed production, which was satisfactory only when the pollinated plant was well supplied with B.

[2244] 633.491 : 551.5
BROADBENT, L. **Potatoes and weather.** *Quart. J. Roy. Met. Soc.* 75, 1949 (302-309). [Rothamsted]

An account is given of the influence of weather conditions on the growth, yield, storage and pathology of potatoes.

[2245] 633.491-1.411.4
WINKLER, H. Potatisodling på torvjord. **[Potato growing on peat soil.]** *Bet. Vall. Moss.* 1, 1949 (3-6). [Sw.]

Yields of 30-35 tons/ha. are obtained at Flahult on peat soils. Heavy fertilizing is usually necessary, particularly of P and K.

[2246] 633.491-1.811-1.67
JACOB, W. C.; WHITE-STEVENS, R. H.; WESSELS, P. H. **The influence of irrigation on the nitrogen, phosphorus and potash requirements of different potato varieties.** *Amer. Potato J.* 26, 1949 (241-255). [Cornell Univ. Agric. Expt. Sta., Ithaca, N.Y.]

For each of 6 varieties tested, the best composition of fertilizer with and without irrigation is stated, but changes in level of N, P and K are proposed for further investigations.

[2247] 633.491-2
SAMUEL, G. G. **The control of potato diseases.** *J. Roy. Agric. Soc. England* 109, 1948 (118-127).

Healthy seed, soil-borne diseases such as common scab, powdery scab, dry-rot fungus and eelworm disease are discussed.

[2248] 633.491-2.2-2.953
PETERS, B. G. **Potato root eelworm, D-D, and soil sterilization. I. Methods and criteria. II. Results for 1946.** *J. Helminth.* 22, 1948 (117-138). Helminth. Abs. 17 (103).

Methods used in setting up a factorial pot

experiment to test the subsequent effects on potato plants of steam sterilization of soil, artificial infection with *Heterodera rostochiensis* and injection with D-D mixture are described.

Eelworm infestation had no significant effect on potatoes; steam sterilization had large beneficial effects; D-D had beneficial effects even in the absence of eelworm infection. There was a negative interaction between D-D and steaming. Analysis was complicated because D-D killed most of the eelworms.

[2249] 633.492-1.35
PARK, J. K. **New sweet potato equipment: Sweeps and digger.** *Agric. Engng.* 30, 1949 (330, 335). [S.C. Agric. Expt. Sta., Clemson]

[2250] 633.498-1.5
WHITE, J. S. L. **The cultivation of *Coleus rotundifolius* (Poir.) A. Cher. et Perrot (Country Potato) in Ceylon.** *Trop. Agricst.* 104, 1948 (151-154).

Country potato is a useful substitute for the potato in the diet of Ceylon people, is almost free of pests and diseases and is suitable for any wet-zone rotational scheme. Best yields are obtained on sandy loams well manured with 20 tons/acre of cattle manure or compost. Heavy soils are unsuitable. The tubers are planted in raised beds which are intercultivated 3 weeks after planting and 3 weeks later, and cattle urine diluted with 50% of water is applied. Planting out is done in ridges to which 10 tons/acre of well-decomposed cattle manure is added. A mulch reduces weeding costs.

633.5 FIBRE PLANTS

(*See also* Abs. No. 2398)

[2251] 633.51-1.589
DANIELSON, C. B.; CROWE, G. B. **1947 studies of flame cultivation in cotton, Yazoo-Mississippi Delta.** *Miss. Agric. Expt. Sta. Circ.* 143, 1948, pp.9.

Weeds are a main obstacle to cotton mechanization. Flamers must be used when the weeds are small and the cotton plants large enough to avoid injury (6-8 inches high). In a wet season, weeds grow too large to be destroyed with a normal flaming. Johnson grass, hogweeds and cocklebursers survived flaming, and tie vines, crab- and coco grass were hard to control when large. The practice is most effective on cotton cultivated fairly flat and several persistent flamings are desirable.

[2252] 633.51-1.67
EREMENKO, V. E. **[The technique of furrow irrigation of cotton.]** *Sovet. Agron.* No. 7, 1949 (83-89). [R.]

In order to get a regular distribution of water the flow of irrigation water and the length of the furrow should be regulated in accordance with the physical properties of the soil, i.e., the lower the permeability and the shorter the furrow the more regular will the distribution be. Given a slope of 0.15-0.01% the length of the furrow should not exceed 100-200 metres in slightly permeable soils, and 50-70 metres in very permeable soils. The water flow should be 0.1-0.5 and 0.4-1.0 l. per second, respectively. On flat land the furrow length should not exceed 30-60 metres.

[2253] 633.51-1.81 : 581.192
NELSON, W. L. **The effect of nitrogen, phosphorus and potash on certain lint and seed properties of cotton.** *Agron. J.* 41, 1949 (289-293). [N.C. Agric. Expt. Sta.]

Applications to a Norfolk very fine sandy loam of N up to 60 lb./acre increased the yield of seed cotton. Deficiency symptoms, strongly marked with N at 10 lb./acre, were noticeable at 35 lb./acre. Factors increased by application of N were: size and number of bolls, upper half mean fibre length, percentage of N in seeds. Decreases were recorded in percentage of lint, amount of waste, X-ray angle and oil content of seeds.

Complete lack of P resulted in dark green plants with retarded growth. Applications of P_2O_5 up to 50 lb./acre produced no marked effects apart from increasing boll size and yield.

The soil concerned was low in K and applications up to 60 lb./acre of K_2O produced marked response. At 30 lb./acre deficiency symptoms were evident, particularly in the upper bolls and their seeds. Increase of K application resulted in increase of size and yield of bolls, of mean fibre length and thickness, of percentage of mature fibres and of X-ray angle. The oil content of the seeds was markedly increased and the N content somewhat reduced. Lower K applications gave finer fibres of increased strength.

[2254] 633.524.3-1.5
DAVID, P. A. **Kenaf (*Hibiscus cannabinus* Linn.) culture in the College of Agriculture at Los Baños.** *Philipp. Agricst.* 32, 1948 (21-30).

633.6 SUGAR CROPS

(*See also* Abs. Nos. 2190, 2326, 2334, 2375, 2387, 2391)

[2255] 633.61-1.461.3
HARDY, F.; HEWITT, C. W. **A preliminary investigation into nitrification in British Guiana sugar-cane soils.** *Trop. Agric. Trin.* 25, 1948 (38-40). [Imp. Coll. Trop. Agric., B.W.I.]

Nitrification tests were carried out on clays and silts from British Guiana sugar-cane areas. Most of the soils were low in available P and K, had medium to high organic content and all were highly acid. Nitrification, even with added lime and NH_4 salts, was barely moderate and both substances tended to reduce the rate when used separately. This failure to nitrify on liming is possibly due to the absence of the requisite nitrifying organisms. The rate of the natural process was highest in recently flood-fallowed soils, whereas flood-fallowing had previously been suggested as a cause, and ammoniacal nutrition of sugar cane as a result, of the absence of nitrifiers. Repetition of tests with addition of P and with heavier liming is required.

[2256] 633.61-1.67·1.347.24
RIOLLANO, A. **Overhead irrigation for sugar cane.** *Sugar* 44, No. 6, 1949 (30-31).

A system used in Puerto Rico is described.

[2257] 633.61-1.81
ROSS, R. **Sugar cane experiments in Trinidad.** *Proc. Agric. Soc. Trin. Tob.* 48, 1948 (271-272).

A long-term experiment with $(NH_4)_2SO_4$ shows no evidence of falling-off in yield increase with time. Moderate applications of super. to ratoon cane appeared to increase the action of $(NH_4)_2SO_4$ but heavy applications reduced it. Pen manure improved the yield of plant cane, but its residual effect on ratoon cane was insignificant.

[2258] 633.61-1.841.1
SOUTH AFRICA SUGAR JOURNAL. **Experiment station notes. Trash management and fertilizer trial on sandy loam soil at experimental farm.** *S. Afric. Sug. J.* 33, 1949 (489-490).

There was a significant increase in yield from $(NH_4)_2SO_4$ at 400 lb./acre as top-dressing to plant cane after short fallow with no green-manure crop. In another experiment the yield of first ratoons after an application of 800 lb. of $(NH_4)_2SO_4$/acre was not significantly greater than with 400 lb./acre, although a marked leaf-colour difference was noted.

[2259] 633.61-2.954
CRAFTS, A. S.; EMANUELLI, A. La erradicación de yerbajos en la caña de azucar. [**Weed eradication in sugar cane.**] *P.R. Esta. Expt. Agric. Bol.* 83, 1948, pp. 26. [Sp.]

The advantages of herbicides over hoeing and cutting of weeds are discussed. Directions are given for the use of 2,4-D and of 30-2-2, a pentachlorophenol oil emulsion evolved in Puerto Rico. 30-2-2 is non-selective. It proved effective against all weeds, whereas 2,4-D stimulated grass weeds, but precautions were necessary in concentration and time of application to avoid damage to the sugar cane.

[2260] 633.63-1.427.3
ULRICH, A. **Plant analysis as a guide in the nutrition of sugar beets in California.** *Proc. Amer. Soc. Sug. Beet Tech.* 5, 1948 (364-377). C.A. 43 (5142).

In pot experiments, addition of P_2O_5 to the soil gave corresponding increases of yield in tops and roots and in P_2O_5 content of leaves. Without addition of K, the leaves were reduced in K content proportionately to the increase of P_2O_5 in the soil. Increase of N in the soil was reflected in leaf nitrate content, the latter decreasing towards harvest.

[2261] 633.63-1.582
PINA, R. F. Las alternativas en el cultivo de la remolacha. [**Rotations in sugar-beet cultivation.**] *Ager Madrid* 4, 1948 (54-55). F.C. Abs. 2 (129). [Sp.]

Suitable rotations for dry and irrigated sugar-beet cultivation are suggested. The preceding crop should preferably be leguminous, and a winter fallow should intervene to allow adequate soil preparation and manuring.

[2262] 633.63-1.81
WHITNEY, R. S.; ROBERTSON, D. W.; GARDNER, R. **Sugar-beet fertilizer experiments on recently leveled land.** *Proc. Amer. Soc. Sug. Beet Tech.* 5, 1948 (353-357). C.A. 43 (5142).

[2263] 633.63-1.811.7/8
WOOD, R. R.; NELSON, R. T. **Comparison of various chloride and sulfate salts as fertilizers for sugar beets.** *Proc. Amer. Soc. Sug. Beet Tech.* 5, 1948 (349-352). C.A. 43 (5143).

NH_4Cl gave greater top growth than $(NH_4)_2SO_4$, and NH_4 salts reduced sugar yield without significant effect on root yield.

[2264] 633.63-2.19 : 546.27
SCHROPP, W.; ARENZ, B. Gefässversuche mit verschiedenen borhaltigen Rückständen zu Beta-Rüben. **[Pot experiments on beet with various industrial waste products containing boron.]** *Z. PflErnähr. Düng.* 42, 1948 (124-131). [G.]

The effect of waste products containing B on the prevention of heart rot and dry rot was compared with that of borax in 2-year pot experiments, using 11.35 mg. of B per pot on sugar and fodder beet. Borax sludge was a good substitute for borax. Boracite at twice the above rate also gave good results. As boracite chalk even in quadruple amounts did not show a satisfactory effect, the B was presumably in an unavailable form. The application of all the products except boracite chalk considerably increased the absolute quantities of protein-N and raw protein in leaves and roots.—B.F.G.

633.7 STIMULANTS

(*See also* Abs. No. 2388)

[2265] 633.71-1.816.3
MATTHEWS, E. M. **Rates and method of applying fertilizer and sidedressings using two spacings—flue-cured tobacco.** *Proc. Natl. Joint Cttee. Fert. Appl. 1947*, 23, 1948 (244-246). Biol. Abs. 23 (1258). [Agric. Expt. Sta., Blacksburg, Va.]

In rows 4 ft. apart on Granville sandy loam, 20-inch spacing was superior to 24-inch spacing. 1500 lb./acre of 3-9-6, if not thoroughly mixed with the soil, was less profitable than a 1200-lb. or a 900-lb. application with supplementary side dressing.

[2266] 633.71-1.816.32
STREET, O. E. **Pennsylvania tobacco fertilizer placement studies—1947.** *Proc. Natl. Joint Cttee. Fert. Appl. 1947*, 23, 1948 (250). Biol. Abs. 23 (1258). [Tobacco Expt. Lab., Lancaster, Pa.]

The yield of tobacco with K in bands was slightly higher than with K broadcast.

[2267] 633.71-1.816.32
SWANBACK, T. R. **Plowing under and plow sole placement of fertilizer versus broadcasting for Connecticut Tobacco.** *Proc. Natl. Joint Cttee. Fert. Appl. 1947*, 23, 1948 (249). Biol. Abs. 23 (1259). [Agric. Expt. Sta., Windsor, Conn.]

On a sandy soil, tobacco yields in lb./acre were 1770 with broadcast and disced fertilizer, 1861 when half was treated as above and the other half placed in the plough sole, 1944 with fertilizer broadcast and ploughed under and 1954 when all was placed in the plough sole.

[2268] 633.71-1.84
CARR, J. M.; NEAS, I. **The relative efficiency of different forms of nitrogen in flue-cured tobacco production.** *Ga. Coast Pl. Expt. Sta. Circ.* 14, 1949, pp. 11.

Investigations were made to determine the relative values of $(NH_4)_2SO_4$, $NaNO_3$, KNO_3, urea, cottonseed meal and a mixture of these substances, as sources of N for tobacco. The control was without N. The soil was Norfolk sandy loam. The lowest yields were obtained from the control and the cottonseed meal, the other fertilizers showing no significant differences, but all producing marked increases. Yields of smoking leaf were lowest with no N and with $NaNO_3$, and highest with cottonseed meal. Dollar returns were highest with urea and (apart from the control) lowest with cottonseed meal, but from smoking grades they were highest from cottonseed meal and lowest from $NaNO_3$. Where single sources of N are used, cotton-seed meal provides insufficient available N, and the cheaper, more readily available sources are more profitable.

[2269] 633.72-1.5
EDEN, T. **Recent advances in tea research.** *World Crops* 1, 1949 (66-69). [E. Afric. Tea Res. Inst.]

Soil-conservation practices, effects of

excessive cultivation and use of fertilizers in India, Ceylon and the East Indies are described. The most spectacular response is to N fertilizer, P comes next and K gives noticeable increases only with young, recently planted tea. Fertilizers should be applied about the middle of the growth cycle. Tables show crop losses due to excessive cultivation and response to fertilizers in the presence and absence of weeds.

[2270] 633.79-1.81
BURGESS, A. H. **The nutrition of the hop crop.** *Farming* 3, 1949 (235-239). [Wye Coll.]
Fertilizing should be adapted to the soil requirements, hops showing little specialization in nutrient demands. Numerous suitable sources of N, both organic and inorganic, are mentioned. P, K and Mg fertilizers are discussed and symptoms of deficiency described. Ca is mainly derived from P manures and from routine liming. Two special manurial schemes found effective in Kent are given in detail. The importance of organic matter is stressed from the point of view of soil structure. The optimum pH for hops is between 6.5 and 7.0, and acidity is detrimental.

633.8 AROMATIC, MEDICINAL AND OIL PLANTS

(*See also* Abs. No. 2330)

[2271] 633.822-1.5
LEVAC, C. La culture de la menthe. **[The cultivation of peppermint.]** *Rev. d'Oka* 23, 1949 (124-147). [F.]
Soils and climate, soil preparation, diseases and pests, and possibilities of cultivation in Quebec are discussed. Peppermint requires a well drained soil of pH 6-7.5 rich in humus and free from weeds, and grows best on black soils near river banks. 300-500 lb./acre of 0-10-20 or 0-20-20 fertilizer should be applied before planting.

[2272] 633.822-1.81 : 581.192
SCHRATZ, E.; WIEMANN, P. **Effect of mineral fertilizers on development and oil content of labiates. I. *Mentha piperita*.** *Pharmazie* 4, 1949 (31-35). C.A. 43 (6290).
Adequate N supply is essential for high oil yields. Addition of P and K did not increase the essential-oil content.

[2273] 633.843-1.81
BARBIERI, R. La concimazione minerale in orticultura. Nota I.—Un triennio di prove sui peperoni in Campania. **[The use of fertilizers in horticulture. I.—A three-year experiment in Campania with green peppers.]** *Ann. Sper. Agrar. Roma* 3, 1949 (199-228). [I.e.] [Portici]
Notes on the composition and Italian production of this solanaceous vegetable, which is mainly grown in Campania around Naples, precede an account of field trials made on 5 varieties in 1945-47 at two centres with three combinations of super. and sulphates of NH_4 and K. Effects investigated included those of NPK with 300 q./ha. of dung (compared with dung alone) on yields, responsiveness of varieties, time of ripening, percentage of unmarketable fruits, mean weight, ash percentage and dry matter of fruit and the economics of manuring. A predominantly phosphatic treatment with not more than 7 q./ha. of $(NH_4)_2SO_4$ gave striking and profitable increases of yield without deterioration of quality. In current practice more than double this amount of $(NH_4)_2SO_4$ is applied. These peppers, of which the commercial yield is of the order of 200 q./ha., are among the heaviest-yielding vegetable crops.—R.N.

[2274] 633.85-1.81 : 581.192
WEICHAN, C. **[The essential-oil content of aromatic plants as dependent on fertilizing.]** *Pharmazie* 3, 1948 (464-467). C.A. 43 (5907).
Use of fertilizer increased yields of marjoram and lemon oil, while only minor changes were observed with oils of thyme, basil, sage, tarragon, savory, dill and fennel.

[2275] 633.852.52-1.35
FARMER'S WEEKLY SOUTH AFRICA. **New groundnut lifter in Free State.** *Farm. Week. S. Africa* 76, April 13, 1949 (95).
Two rows of groundnuts are loosened by two mouldboard shares attached to the cultivator attachment under the tractor. The lifted plants are thrown inwards. The machine picks up the loosened plants with a series of teeth on parallel bars affixed to endless chains revolving round a slanted board. The collected plants are dropped on a platform from which they are deloaded in

equally-spaced windrows. The machine can lift 12 morgen of groundnuts a day. It was imported from U.S.A.

[2276] 633.852.52-1.81 : 577.16
REDDI, K. K.; GIRI, K. V. **Influence of variety, manuring, and germination on vitamin B_1 content of groundnut—*Arachis hypogea.*** *Curr. Sci.* 16, 1947 (285). [Inst. Sci., Bangalore]

Application of organic and artificial fertilizers had no significant effect on the vitamin-B_1 content.

[2277] 633.852.52-1.811
HARRIS, H. C. **Effect on growth of groundnuts of nutrient deficiencies in the root and pegging zone.** *Plant Physiol.* 24, 1949 (150-161).

Nutrient requirements of the roots and pegs of groundnuts were studied by withholding various elements from the root and pegging zone the last 51 days of the growing season. Very few nuts developed without Ca in the pegging zone and S in the pegging zone was beneficial: leaving Mo out of the root zone seemed to decrease the yield of tops. Small amounts of radioactive P and Co were absorbed by the pegs and translocated to other parts of the plant, but the pegs received more of these elements when applied to the roots than when applied to the pegs. There was no consistent relationship between top growth and nut production. A balanced supply of nutrients in the root zone, and Ca and perhaps S in the pegging zone are necessary for the best production of nuts.

[2278] 633.854.78-1.5
ELLIOTT, H. G. **The sunflower (*Helianthus annuus*).** *J. Agric. W. Aust.* 26, 1949 (44-49).

Soils ranging from sandy to medium heavy loams are suitable for sunflowers, the best results being given by rich alluvial soils. Maize-growing soils are generally well suited but sunflower crops have the advantages of better resistance than maize to cold and drought. In Western Australia they are successful on soils previously planted with subterranean clover, with either super. or preferably potato manure at 2-3 cwt./acre.

633.9 RUBBER PLANTS

[2279] 633.912-1.415.1
VOLLEMA, J. S. Over de invloed van de waterstofionen concentratie op de groei van rubber. **[On the influence of hydrogen-ion concentration on the growth of rubber.]** *Arch. Rubbercult.* 26, 1949 (257-268). [Du.e.]

From pot experiments with rubber seedlings in sandy and clayey loam, with pH ranges of 5-7.7 and 3.8-8 respectively, it was found that acidity is highly beneficial to young rubber although older plants are less sensitive to acid. The response of young rubber to acidity is more marked in sandy than in clayey soil. Poor soil structure may be as detrimental as alkalinity. Satisfactory growth occurs on alkaline subsoil if the upper layer is acid and 75 cm. or more in depth. Sulphuric mud was beneficial in field trials when applied to the planting holes but is uneconomic in shallow soils with poor structure.

[2280] 633.912-1.584
PFÄLTZER, A.; VOLLEMA, J. S. Over de invloed van het bodemdek op de diktegroei van Hevea. **[On the influence of a soil cover on the growth of Hevea.]** *Arch. Rubbercult.* 26, 1949 (289-301). [Du.e.]

Growth of young rubber trees was most rapid under a clean-weeding system but the disadvantages were danger of soil erosion and of infection by *Fomes lignosus*. A cover of *Centrosema pubescens* only slightly retarded growth, especially when clean-weeded circles (3 m. diameter) were maintained round the trunk bases. Interplanted and pruned *Tephrosia* hedges checked growth somewhat in the first two years and did not completely prevent erosion. A catch crop of *Derris* retarded tappability by as much as a year.

[2281] 633.912-1.81
SCHOONNEVELDT, J. C. VAN Optimum-bemestingsproef bij jonge rubber in proeftuin Peweja. **[Fertilizer trial on young rubber at the Peweja experiment station.]** *Arch. Rubbercult.* 26, 1948 (201-219). [Du.e.]

The soil of the plots (pasture ploughed up in 1938) is an old laterite known to be deficient in P and K. Each plot consists of 14 P.R. 107 buddings arranged in zig-zag rows. There are 8 fertilizer treatments

comparing different NPK ratios; replication 5-fold. Planting was done on December 9 1938. Results are presented for girth measurement in November 1943 and for yield at August 1944, and for girth in earlier years.

The beneficial effect of fertilizer treatment on growth is evident after the first year; the optimum N dressing is 150 g. of $(NH_4)_2SO_4$ per tree. The difference in growth from successive P dressings is as yet insignificant, but the optimum P dressing is said to be 500 g. of rock phosphate in the planting hole plus 112 g. of double super. per tree. Progressive doses of K up to 500 g. per tree increase girth measurements significantly.

The yield of dry rubber per tree is unaffected by fertilizer treatment, but the yields per unit area, which depend on the numbers of tappable trees, are increased by treatment. Leaf-analysis data recorded are inconclusive.—K.S.

[2282] 633.912-1.81

HAINES, W. B. **The cultivation and manuring of rubber trees.** *Comm. Bur. Soil Sci. Tech. Commun.* 46, 1949 (217-219).

Clearing of forest for rubber plantations affects soil temperature, intense rainfall either washes away the surface soil or compacts it and humus is burnt up. In re-planting rubber, N and P fertilizers are important and K may be a local need. N alone is usually sufficient to increase yield of old rubber trees. Completely derelict areas of old rubber have been successfully replanted by manuring and cultivating with ground covers. The earliest signs of deterioration in a plantation are seen in falling leaf, and regular measurement of leaf density forms the best aid in determining when fertilizers should be applied.

[2282] 633.912-2.4

HELL, W. F. VAN Resultaten van de bestrijding van de witte wortelschimmel in een herplanting. **[Root disease caused by *Rigidoporus microporus* (Swartz) v. Overeem in young rubber replantings.]** *Meded. Alg. Proefsta. A.V.R.O.S. Rubberserie* 123, 1949, pp. 36. [Du.e.]

The degree of infection depends on the amount of infection in the previous stand, the method of replanting and the type of soil. In loose sandy soils, infection is generally deeper than in stiff clay.

634 ORCHARDS. FRUIT

(*See also* Abs. Nos. 2395, 2407)

[2284] 634-1.459-1.61

HUSTON, J. J. **An approach to the problem of erosion control in established orchards.** *J. Soil Conserv. Serv. N.S.W.* 5, 1949 (129-133).

Measures described include the construction of grassed waterways, graded banks and diversion banks. The general inadequacy of resoiling is discussed.

[2285] 634-1.584-1.84

ROGERS, W. S.; RAPTOPOULOS, TH.; GREENHAM, D. W. P. **Cover crops for fruit plantations. IV. Long-term leys and permanent swards.** *J. Hort. Sci.* 24, 1948 (228-270). [E. Malling Res. Sta.]

In 7-year experiments on swards in fruit plantations, yield of cut grass was increased by applications of up to $7\frac{1}{2}$ cwt./acre of $(NH_4)_2SO_4$; a further $2\frac{1}{2}$ cwt./acre gave little extra increase. Clovers could be maintained only when no N was applied, but clover-produced N was insufficient for the trees. Super. stimulated the cover-crop yield only in the presence of clovers. Plots on which green material was disced-in showed no increase in organic matter 7 months later. The C/N ratio showed that decomposition had been rapid. The soil of these plots was less compact than that of plots cultivated regularly. The soil under grass dried out more quickly in summer than did cultivated soil and was more easily replenished in winter.

Grassing-down initially checked tree growth but growth rate recovered to normal and after 6 years on plots receiving 5 cwt./acre of $(NH_4)_2SO_4$ growth exceeded that of clean-cultivated trees. Grassing-down resulted in N shortage, but trees responded quickly to applications of 10 cwt./acre of $(NH_4)_2SO_4$ or to discing-in of the sward.

[2286] 634-1.584-1.84

ROGERS, W. S.; RAPTOPOULOS, TH.; GREENHAM, D. W. P. **Cover crops for fruit plantations. V. Effect of form and time of application of nitrogen on orchard swards.** *J. Hort. Sci.* 24, 1948 (271-283). [E. Malling Res. Sta.]

Nitro-chalk, $(NH_4)_2SO_4$ and $NaNO_3$ were equally effective in suppressing clover;

reduction was greatest when fertilizers were applied early. Yield increases of cut material were the same for all 3 forms of N and increases were greatest from early applications. It is suggested that, as N-deficiency symptoms in early stages of grassing-down can only be avoided by applications of N which suppress clovers from a grass-and-clover mixture, the most likely method of obtaining a sward capable of supplying N to trees is to sow a pure legume and to minimize the competing effect of invading grasses by frequent mowing.

[2287] 634-1.81
SHAW, J. K. **Fertilizer experiments on an abnormal orchard soil.** *Mass. Agric. Expt. Sta. Bull.* 444, 1947. Biol. Abs. 22 (2231).

$NaNO_3$ alone and S alone injured apple and peach trees. Lime improved growth. When the pH of the soil was below 4 the trees made no growth. The addition of organic N to a very acid soil increased soil nitrates and improved growth; inorganic N did not improve growth. Lime was injurious to grapes, which grew as well on untreated as on fertilized plots. Growth on limed plots was better in the presence of K.

[2288] 634-2.19
MULDER, D. Voedingsziekten van vruchtbomen. **[Nutrition diseases of fruit trees.]** *Meded. Direct. Tuinb.* 12, 1949 (594-606). [Du.e.] [Lab. Zeelands Proeft., Wilhelminadorp]

The name 'nutrition diseases' is proposed as an improvement on 'deficiency diseases'. The author reviews diseases of fruit trees in the Netherlands caused by lack of K, Mg, Fe, Mn, Cu, Zn and N, with reference to the soil types on which they are most evident. Lack of B is a probable cause of bitter-pit in apples. Control of nutrition diseases is discussed under (a) soil improvement, (b) injection and (c) spraying.

[2289] 634-2.954 : 577.17
LUCKWILL, L. C. **Hormones in the fruit garden.** *J. Roy. Hort. Soc.* 74, 1949 (397-401).

The use of hormones as weedkillers to delay bud burst and to reduce pre-harvest drop of fruit is discussed.

[2290] 634.3-1.811.1
VAN DER MERWE, A. J. **Nitrogen nutrition of citrus trees in the nitrate and the ammonium form. I. Quantity and forms of inorganic nitrogen.** *Farm. S. Africa* 24, 1949 (243-245). [Div. Hort., Pretoria]

Owing to the low concentration of nitrate N in ammonium-treated plots, trees had no option but to absorb the available N predominantly in the NH_4 form. All citrus trees began to absorb N in September when the NH_4 form was available. The application of slaked lime influenced the conversion of NH_4 to NO_3 nitrogen. The use of $(NH_4)_2SO_4$ accelerated the rate of acidification of the soil and retarded nitrification; applications of kraal manure did not retard acidification. The leaching of nitrate N was far more rapid than that of ammonium N. It is recommended that inorganic forms of N should be applied frequently in small quantities and that sandy soils should be irrigated frequently with small quantities of water.

[2291] 634.31-1.4
MARTIN, J. P. **Growth of citrus seedlings in old citrus soils.** *Calif. Citrog.* 34, 1949 (102, 110, 111). Biol. Abs. 23 (1278).

Orange seedlings made 50%-175% more growth in non-citrus soils than in soils which had supported citrus trees 40-70 years. Seedlings in old soils did not respond to applications of P, K, Mg, Cu, B, Zn or Mn. Soil fumigation with CS_2, ethylene dichloride, DD, or chloropicrin stimulated growth but not to a point comparable with that in non-citrus soils.

[2292] 634.58-1.5
BOUFFIL, F.; JEANDEL, P. Essais de culture de l'arachide en lignes jumelées à la station expérimentale de l'arachide de M'Bambey. **[Trial cultivation of groundnuts in double rows at the groundnut experimental station of M'Bambey.]** *Agron. Trop.* 4, 1949 (311-318). [F.]

The advantages—mainly in facilitating mechanical cultivation—of the double-row system over the usual single-row culture are described. The 2 rows of a pair are 20 cm. apart, with 80 cm. between one paired row and the next.

[2293] 634.58-1.81

BOUYER, S.; TOURTE, R. Contribution à l'étude de la fumure des terres à arachides du Sénégal. **[Contribution to the study of the fertilizing of groundnut areas in Senegal.]** *Agron. Trop.* 4, 1949 (266-300). [F.]

Groundnut soils in Senegal are sandy, slightly acid, poor in humus and nutrients. To obtain a yield of 1500 kg./ha. it is necessary to use 20 kg. of P_2O_5, 50 kg. of K_2O and light applications of N. Excess of N causes pronounced vegetative growth and reduces seed yield; it also reduces root-nodule production. Excess of P_2O_5 proves toxic in sandy soil, but P is important in promoting nodule formation and early maturing of the crop. Accumulation of starch and protein is favoured by K. Application of N and K should be made at or before seeding but P may be applied at intervals during growth.

Where rainfall is heavy, NH_4 fertilizers are preferable to NO_3. Soil acidity adversely affects $CaHPO_4$ and in such cases $Ca_3(PO_4)_2$ is used; its action is slower but residual benefits last 4-5 years. The NPK balance is important. Various NPK formulae used in the U.S.A. are given, also those proposed for experimental use in Senegal. Substitution of a mixture of 40% of K_2O, 10.8% of CaO and 7% of MgO for the KCl in the basic formulae was beneficial except in very low N and P mixtures. The maximum useful rate for application of most mixtures was 250 kg./ha.

[2294] 634.58-1.81

SAUGER, L.; GENUYT, G. Un essai de fumures de l'arachide. (Formule et dose d'un engrais NPK). **[An experiment with fertilizers for groundnuts. (Composition and application rate of a NPK fertilizer.)]** *Agron. Trop.* 4, 1949 (301-310). [F.]

For conditions at M'Bambey, the most profitable fertilizer was a 9-7-19 NPK mixture consisting of 43.5% of $(NH_4)_2SO_4$, 18.1% of $CaHPO_4$ and 38.4% of KCl. The optimum rate was 150 kg./ha. The increase in yield of pods above the unmanured control was 21%.

[2295] 634.58-1.811

BOUYER, S. Croissance et nutrition minérale de l'arachide. **[Growth and mineral nutrition of the groundnut.]** *Agron. Trop.* 4, 1949 (229-265). [F.] [Sta. Expt. Arach., M'Bambey]

Details are given of experiments in groundnut cultivation in Senegal. Growth of the plant as a whole, and of its component parts, was analysed for the effects of mineral nutrition and climatic variations at different stages from germination to maturity.

Uptake of K was high between the 40th and 80th days of growth but negligible in earlier and later phases. Absorption of Ca was also highest during the middle growth period. Mg was not absorbed as heavily as Ca, but had direct influence on oil formation. Uptake of N was seven times that of P_2O_5 (the high figure probably being due to low P content of the soil).

[2296] 634.73-1.5

READ, F. M. **Berry fruits in England and America.** *J. Dept. Agric. Victoria* 47, 1949 (289-300).

Blueberries grow profitably on poor, acid, sandy loams if the moisture supply is uniform and continuous and $(NH_4)_2SO_4$ is supplied. High-bush varieties need a pH of 4-5, which is sometimes produced by adding S.

[2297] 634.75-2.954 : 577.17

CARLSON, R. F. **Weed control in small fruits.** *Agric. Chem.* 4, No. 8, 1949 (37-39, 71). [Mich. St. Coll., East Lansing]

Several varieties of strawberries have responded favourably to both pre- and post-planting applications of 2,4-D at low concentrations. Weed control was successful except for chickweed (*Stellaria media*) which resisted 2,4-D, but was killed by IPC (isopropylphenylcarbamate). This compound proved harmless to strawberries at rates of 10-15 lb./acre.

Raspberries were adversely affected in new shoots by 2,4-D. The grass weeds among canes were not effectively destroyed by dinitro herbicides but autumn applications of 60 lb./acre of trichloroacetate were very effective and avoided damage to the canes.

[2298] 634.8-1.416.2
MAUME, L.; DULAC, J. **["Presumably assimilable" phosphoric acid and truly assimilable phosphoric acid of vineyard soils.]** *C.R.* 228, 1949 (944-946). C.A. 43 (5141). [F.]

The "presumably assimilable" P content of vineyard soils gave no correlation with P content of vine leaves grown on them.

[2299] 634.8-1.811.2
FRANC DE FERRIÈRE, P. J. J. Alimentation phosphatée de la vigne. **[Phosphatic uptake by vines.]** *C.R. Acad. Agric.* 35, 1949 (407-410).

Pedological and foliar-diagnostic methods were used to study phosphate nutrition of vines in Atlantic and Mediterranean climates in France.

Available P_2O_5 was estimated and plotted against percentage of P_2O_5 in leaves at the peak of vegetative growth. In the year with a wet spring, uptake was higher than in the preceding year when the spring was dry. In both, uptake rose with availability up to a certain point and remained constant in soils richer in P_2O_5, limits being approximately 0.04% and 0.09% for wet and dry seasons respectively in non-calcareous, and lower in calcareous soils. In Mediterranean climates, rainfall and irrigation showed more strongly the influence of water as well as of P_2O_5 content of the soil on the uptake by vines.

634.9 FORESTRY

(*See also* Abs. No. 2345)

[2300] 634.9-1.4 : 581.5
DAY, W. R. **The relation between soil conditions, type of ground vegetation, and the growth of trees.** *Forestry* 22, 1948 (184-193). [Dept. Forestry, Univ. Oxford]

Under adverse soil conditions, forest trees tend during their early life to suffer from chronic chlorosis caused by competition of the ground vegetation. The chlorosis is relieved by suppression of this vegetation either by cultivation or by mixing susceptible species with one less susceptible to the effects of the competition. Larch is susceptible, and chlorosis is less severe when Scots pine is mixed with the larch. The chronic chlorosis is related to ineffective root development due to shallow soil or to the state of the air/water balance in the soil, and not to the absence of appropriate mycorrhizal fungi. Root growth in humus was equally good whether the humus was derived from debris of ling, spruce or bracken.

[2301] 634.9-1.433
MINA, V. N. **[Carbon dioxide in the atmosphere of forest soils.]** *Dokl. Akad. Nauk* 64, 1949 (557-560). C.A. 43 (5141). [R.]

CO_2 content of air in the upper 10 cm. of forest soils ranged from 0.4% in scrub and semi-open to 1.4% in deep forest, and varied approximately inversely with humus and moisture content. The diurnal maximum is reached in early afternoon and the minimum at night.

[2302] 634.9-1.44 : 636.084.22
LUNT, H. A. **Soil type as a factor in forest grazing in the Northeast.** *Proc. Soc. Amer. Foresters* 1948 (249-257).

Forest grazing by domestic livestock occurs on either (a) woodlots or (b) neglected permanent pastures on abandoned cultivated land which is being invaded by trees; (b) contributes much more forage per acre than (a). The soils include deep, well drained, fertile loams and silt loams too stony or steep for other uses, or coarse dry soils, shallow rocky soils or wet soils which are difficult to improve economically. The soils of the Northeast are classified according to whether they should be managed for grazing or be allowed to revert to forest or be planted to trees.

[2303] 634.9-1.466.1
MELIN, E. **Recent advances in the study of tree mycorrhiza (a summary).** *Trans. Brit. Mycol. Soc.* 30, 1948 (92-99). For. Abs. 10 (459).

[2304] 634.953.6-1.43
BAIKO, V. P.; GORBULENKO, A. S. **[The effect of forest shelter belts on the soil.]** *Pochvovedenie* 1949 (313-324). [R.]

The effect on the profile and structure of chernozem soils of forest strips (shelter belts) varying in width from 106 to 6 metres, was compared with that of fields under cultivation. When the trees were about

5 years the influence of forest litter began to be apparent. The depth of the A+B horizons increased under the shelter belts, and soil structure changed from cloddy-granular to stable granular. The wider the shelter belt the more water-stable were the structural units > 1 mm. Structural stability also increased with the age of the shelter belt, and the water-absorbing capacity also increased. Soil-moisture content was higher under narrow strips in the spring, but lower in the summer. The soil under shelter belts had a higher organic-matter content than the surrounding fields, and the organic matter in the soils of the wide shelter belts contained more humic acids than did the field or the narrow-shelter-belt soils.

[2305] 634.956.4-1.5

POMEROY, K. B. **The germination and initial establishment of loblolly pine under various surface soil conditions.** *J. Forestry* 47, 1949 (541-543). [Forest Expt. Sta., Asheville, N. C.]

Soils that have been disturbed by logging activities are best for establishing loblolly pine. The germination rate becomes progressively poorer as the surface grades from well-burned to undisturbed litter. The greatest loss of seedlings occurred on silt loams and clay loams that had been baked by fire or puddled by logging equipment. The soil surface should be scarified by the use of tractor equipment or a heavy disc plough, or good seed-bed conditions can be obtained by the judicious use of fire.

[2306] 634.972.5-1.416.7

HARLEY, J. L. **Soil conditions and the growth of beech seedlings.** *J. Ecol.* 37, 1949 (28-37). [Dept. Bot., Univ. Oxford]

Beech seedlings showed greater growth in calcareous than in non calcareous soils, but a non-calcareous brown earth produced good early growth. Stem, branches and leaves were particularly better developed in calcareous soils, but root systems were more extensive in non-calcareous. Mycorrhizal infection was not correlated with soil type or with seedling size.

[2307] 634.975-1.85

YOUNG, H. E. **The response of loblolly and slash pines to phosphate manures.** *Queensland J. Agric. Sci.* 5, 1948 (77-105).

Deficiency of P is a major factor in causing poor pine growth. Application of 818 lb./acre of super. gave the greatest girth increase. Applications of super. ranging from 190 to 1580 lb./acre increased height; 190 lb./acre was almost as effective as 1580 lb. Soil-P content increased with the treatment and there was no leaching downwards of the P, which was fixed in the top 4 inches. Ash analysis of green and dead pine needles is discussed and wood volume increment is correlated with needle-P content. Symptoms of fused needle have disappeared on plots receiving 818-1580 lb./acre of super. and have decreased on those receiving 190-383 lb./acre. On plots receiving rock phosphate in place of super. measureable growth response did not occur until a season later, but thereafter responses were approximately parallel. Rock phosphate had the same effect as super. on fused-needle incidence.

[2308] 634.989.84-1.461.1/3

PURI, G. S. **Ecological problems of the humus layer in English forests.** *Proc. Indian Sci. Cong., Allahabad,* 1949 (148-150). [Forest Res. Inst., Dehra Dun]

Tree litter with high C/N and C/lime ratios is less readily eaten by worms and its decomposition under natural conditions is slower than litter of low C/N and C/lime ratios. The rapid decomposition of litter acts against soil acidity and maintains a high base status of the soil. Accumulation of litter accentuates leaching and makes the soil infertile. Trees with high lime requirements and low C/N ratio tend to increase soil fertility forming mull soils; those with low lime requirements and high C/N ratio generally produce poor, mor soils. Soil fertility is important in the regeneration and establishment of forests. Most English forest trees regenerate on mull soils; only pine, birch and mountain ash regenerate on mor soils. The danger of planting the latter group of trees is stressed.

635 HORTICULTURE

(*See also* Abs. No. 2408)

[2309] 635-1.435.4
WILSON, J. **The treatment of heavy soils.** *J. Roy. Hort. Soc.* 74, 1949 (401-404).

Drainage, ridging, lime, humus, opening materials and burning are discussed for garden soils.

[2310] 635-1.472
LIERE, W. J. VAN De invloed van het bodemprofiel op de ontwikkeling van enige tuinbouwgewassen. **[Influence of soil profile on the growth of some horticultural crops.]** *Meded. Direct. Tuinb.* 12, 1949 (677-683). [Du.e.]

Soil types markedly affect the results of steam sterilization; sandy soils and silty clays behave quite differently in this respect.

On peat soils near Amsterdam, fusarium wilt of cucumbers is being controlled by grafting, which greatly increases yield. The best soils produce lower yields than soils of medium quality. Lettuce is highly sensitive to soil texture.

Horticultural soils are classified on the basis of a soil-survey map into types (a) suitable for market gardening and fruit farming, (b) for fruit only, (c) for market gardening only and (d) for one or more special crops only. Within each type excellent, good and fair-quality grades exist.

[2311] 635-1.62
PIJLS, F. W. G. Drainage in de tuinbouw. **[Drainage in horticulture.]** *Meded. Direct. Tuinb.* 12, 1949 (709-716). [Du.e.]

In horticulture, only pipe drainage is recommended. The standard requirement for good agricultural drainage in the Netherlands is disposal of 5 mm. of superfluous rainfall in 24 hours, and a water table no higher than 50 cm. below the soil surface. The depth of draining is determined by the water level in the ditches and by soil profile, and spacing of pipes depends on depth of draining and on soil permeability. An apparatus for determining permeability was designed by Hooghoudt and simplified by Visser at Wageningen.

For horticulture, it is suggested that agricultural standards need modification, and methods of drainage should be adapted to local soil types.

[2312] 635-1.875
GROOTENHUIS, J. A. De betekenis van compostmeststoffen voor de tuinbouw. **[The significance of compost for horticulture.]** *Meded. Direct. Tuinb.* 12, 1949 (698-708). [Du.e.]

Composts made from garden waste, town refuse and sewage sludge are of importance in horticulture. Chemical analysis alone is insufficient for judging the soil-improving properties of a compost, and the effects of any compost depend on the nature of the soil in which it is used. Compost is beneficial to soils deficient in Cu, B and Zn, and is a good mulch for fruit trees. On light soils, town-refuse compost may cause overliming (Mn deficiency).

[2313] 635.34-1.415.1
ARCIAGA, A. M.; GALVEZ, N. L. **The effect of soil reaction (pH) on the growth of pe-tsai plants and on their nitrogen, calcium, and phosphorus content.** *Philipp. Agricst.* 32, 1948 (55-58).

A clay loam of pH 7.0 was used for the growth of pe-tsai (*Brassica pekinensis*, Chinese cabbage) and its pH was modified over a range from 3.7 to 8.6 by means of H_2SO_4 or $Ca(OH)_2$. Values of 3.8 and lower were completely toxic and at 4.0 toxicity was considerable. From 4.2 to 5.9 growth was normal, from 5.9 up to 8.6 it was good, with the best results at slight alkalinity. Neither pH nor rainfall significantly affected the N, Ca or P content of the plants.

[2314] 635.48-1.5
MINISTRY OF AGRICULTURE. **Rhubarb.** *Min. Agric. Bull.* 113, 1949, pp. 35.

[2315] 635.64-1.811
OWEN, O. **Nutrition of farm crops. X. Nutrition of glasshouse tomatoes.** *Farming* 3, 1949 (264-268). [Expt. Res. Sta., Cheshunt]

The functions of organic matter, lime, N, P, K, Mg, Ca, Fe and Mn in connexion with the tomato plant are discussed. Mg should be classed as a major element so far as tomatoes are concerned. Stable manure or composted straw should be applied. Recommended annual applications of fertilizers are 25-30 cwt./acre of K_2SO_4, 8-10 cwt. a

few days before planting and the rest as a top dressing; 18 cwt./acre of $(NH_4)_2SO_4$ or 26 cwt. of blood, horn and hoof, 6-12 cwt. of which should be applied before planting; 130 lb./acre of P_2O_5 as top dressing; small dressings of lime. Fertilizers should be used judiciously rather than as a panacea for all ills.

[2316] 635.935.79-1.81
McCLELLAN, W. D.; STUART, N. W. **Fertilizers for gladiolus.** *Bull. Amer. Gladiolus Counc.* 13, 1948 (68, 70, 72, 73). Biol. Abs. 23 (1292)

Gladiolus cormels that received high levels of N, P and K produced corms three times as heavy as those where low levels were received. Weight decreased with low levels of N but only slightly if either K or P was low. In a field test on sources of N, most flowers are produced from unfertilized checks and greatest corm weight from fertilizing with peanut hulls followed by checks.

GEOGRAPHICAL

(4) EUROPE

(*See also* Abs. Nos. 2140, 2148)

[2317] (42)63
HANLEY, F. **The fenlands.** *Agriculture* 56, 1949 (214-220). [Sch. Agric., Cambridge]

The history of the fens, farming on the Black Fen, the place of grass and livestock in fenland farming and cropping problems are discussed.

[2318] (42)631.81 : 631.452
BARKER, A. S. **Supplies of some raw materials in British agriculture and their implications on soil fertility.** *J. Proc. Agric. Econ. Soc.* 7, 1947 (218-235). F.C. Abs. 2 (93).

The feeding of home-grown crops to stock is held responsible for a greater removal of nutrients from the soil than that due to crop-raising and stock products combined. The conclusion has been confirmed that in pre-war years P was applied too liberally to arable land and too scantily to pasture.

[2319] (43)631.4.001.89
STREMME, H. E. Bodenkunde. **[Soil science.]** *Naturforsch. Med. Deutschland 1939-1946*, Vol. 48, 1948 (89-109). [G.]

A condensed review, with 86 references, of the more important German books and papers published between 1939 and 1944 on soil types, mapping, erosion, dynamics and mineralogy and on the practical application of research results. Part of the FIAT Review of German Science.

[2320] (436)631.421
ZELLER, A. Die neuen Methoden der Auswertung und Anlage landwirtschaftlicher Versuche. **[The new methods of evaluating and laying out agricultural experiments.]** *Bodenkultur* 3, 1949 (280-282). [G.]

A short report of the business of a conference concerned mainly with the statistical methods originating from Fisher's work, together with recommendations concerning the statistical control of agricultural experimentation in Austria.

[2321] (44)631.415.1
FERRIÈRE, J. F. DE pH des sols de la zone Méditerranéenne française. **[Soil pH in the Mediterranean region of France.]** *Ann. Agron.* 19, 1949 (508-517). [F.] [Soc. Comm. Potasses Alsace, Mulhouse]

In this region, climate and topography lead to the predominance of erosion over leaching, and so to a marked influence of parent rock on the nature and reaction of soils.

Calcareous soils with a pH up to 8 are most common; these carry highly productive vineyards, orchards, market gardens, rice fields and irrigated grassland. Neutral or slightly acid soils occur on siliceous rock, the surface layers often developing slight alkalinity from wind-borne lime or from burning.

Distinctly acid soils are present in the Menton district and eastern Pyrenees. The region of maximum acidity is the watershed separating the Mediterranean and the Atlantic climate zones; here pH decreases to 5 or less and basic slag or powdered rock phosphate is necessary for cultivation.

[2322] (44)633.2.03-1.5
HEDIN, L. La conservation et l'exploitation de la prairie. **[Conservation and exploitation of grassland.]** *Cah. Ingén. Agron.* 4, Nos. 47-48, 1949 (31-32). [F.]
Profitable management of French mountain pastures and of marshy grassland is discussed, and reference is made to complementary grazing. The roles of drainage, irrigation and fertilizing are pointed out, and the merits of ley farming are discussed briefly.

[2323] (45)631.4
ROGAI, F. I terreni della provincia di Pisa. **[The soils of the province of Pisa.]** *Ann. Fac. Agrar. Univ. Pisa* 9, 1948 (219-278). [I.e.f.g.]
Physical and chemical properties of 500 soils are discussed and tabulated.

[2324] (45)631.414.2
BOTTINI, O.; LISANTI, L. **[Chemical composition of the colloidal fraction of some Italian soils.]** *Ann. Fac. Agrar. Univ. Bari* 6, 1947 (176-199). C.A. 43 (5891). [I.]
Chemical data of 12 Italian soils are compared with those of their colloidal fraction. The silica-sesquioxide ratio for the latter was 1.6/2.8.

[2325] (46)631.414.2
ALEIXANDRE FERRANDIS, A. Analisis termico diferencial de algunas arcillas y caolines españoles. **[Differential thermal analysis of some Spanish clays and kaolins.]** *An. Edaf. Fisiol. Veg.* 8, 1949 (33-58). [Sp.e.]
Data are presented for various kaolins, brickwork clays, white and green esmectic clays and a bentonite of :—chemical composition, base-exchange capacity, the results of differential thermal analysis and the hygroscopicity and dehydration curves.

[2326] (46)633.63-1.67
PINA, R. F. Riegos. Temas remolacheros. **[Irrigation. Schemes for sugar beet.]** *Ager Madrid* 4, 1948 (23-24). F.C. Abs. 2 (129). [Sp.]
Sugar beet depends on irrigation in most parts of Spain. Irrigation is best carried out at night, but excess should be avoided since this reduces the sugar content in the crop.

[2327] (47)631.4
SKORINA, S. A. **[Soils of the Chernovits region of the Ukraine.]** *Pochvovedenie* 1949 (325-331). [R.]

[2328] (47)631.417.2
VINOKUROV, M. A.; ALPATOVA, R. A. **[The composition of the humus of the soils in the Tartar Republic.]** *Pochvovedenie* 1948 (489-494). C.A. 43 (5141). [R.]
Various weakly and medium podzolized soils, also a leached rendzina, dark grey meadow soil and degraded chernozem were analysed. Humic acid decreased from leached chernozem to medium-podzolized soil. Fulvic-acid content was low and not related to soil type; it decreased from medium-podzolized to chernozem soils. The C/N ratio was wider in humic acid, fulvic acids and humins than in the original soils. The lowest C content (27-28% of the insoluble residues) was found in leached chernozem and dark grey weakly-podzolized soils, the highest (42-43%) in grey weakly-podzolized soils and leached rendzina.

[2329] (47)631.459 : 631.61
SOBOLEV, S. S. **Protecting soils in the U.S.S.R.** *Soil Conservation* 13, 1947 (17-19).
Erosion due to thawing and run-off and to wind are described. Erosion-control measures are discussed from the viewpoint of snow retention, run-off regulations, crop rotations with perennial grasses, shelter belts and improved farm practices.

[2330] (47)633.85-1.5
HAUSSMANN, G. **Cultivation of oil-producing plants in U.S.S.R.** *Olearia* 3, 1949 (24-31). B.A.BIII, 1949 (299).

[2331] (471)631.44
AALTONEN, V. T.; AARNIO, B.; HYYPPÄ, E. ET AL. Maaperäsanaston ja maalajien luokituksen tarkistus v. 1949. **[A critical review of soil terminology and soil classification in Finland in the year 1949.]** *Maat. Aikak.* 21, 1949 (37-66). [Fi.e.]
A proposed classification of Finnish soils for co-ordination of terminology in all branches of soil science. The Finnish classification is based on all properties, including parent material, genesis, texture, profile development and changes due to

farming. Because of the rather uniform geology all Finnish soils fit into this classification and no soil series are needed.

[2332] (479)631.4 : 551.432
TROITSKY, A. I. **[Soil geomorphological regions of the mountainous part of northern Osetia.]** *Pochvovedenie* 1949 (410-415). [R.]

[2333] (485)631.416.873 : 619
SVANBERG, O.; EKMAN, P. **Some analytical work on cobalt in Swedish hay and soils.** *Kgl. LantbrHögsk. Ann.* 16, 1949 (558-567). [E.]

The need for fertilizing soils with Co in Sweden is on the whole not great, but a considerable number of hay and pasture samples showed Co contents insufficient for ewes and lambs while sufficient for cattle. In experiments on peat soils, in spite of a pronounced fixation of Co in the upper layers, Co was much more available than Cu to vegetation, and its action more immediate.

[2334] (485)633.63-1.582
BERG, T. Sockerbolagets odlingstekniska undersökningar. 2.e. Skiftesbruk. **[Swedish Sugar Company's investigations of cultivation technique. 2.e. Crop rotation.]** *Socker. Handl.* 5, 1949 (107-117). [Sw.e.]

Statistical analysis of crop rotations which include sugar beet, from over 1,000 Swedish farms, to ascertain differences between different districts and between farms of different size.

[2335] (492)631.616
FRANKE, A.; VISSER, C. **Crops grow on Walcheren again.** *World Crops* 1, 1949 (37-40).

An account is given of reclamation of the island of Walcheren after strategic sea flooding, including draining operations, repair of dykes, elimination of salt from the soil and the establishment of crops and grassland. Soil structure, destroyed by sea salt, was restored by applying accurately calculated amounts of gypsum. Grassland soils, in which humus had prevented deterioration, were treated instead with chalk marl.

[2336] (492)631.81
BRUIN, P. **Improving soil fertility in the Netherlands.** *Amer. Fert.* 3, No. 4, 1949 (7-8, 24, 26, 28). [Inst. Soil Res. T.N.O., Groningen]

The yielding capacity of the arable Netherlands soils may be raised by 15-20% by application of N, Ca, K and P. Some improvement is also to be expected from the use of Mg. At present, manuring only partly covers loss of Ca and Mg by leaching and crop nutrition. Permanent pasture needs a higher P and K status and improved drainage and parcelling; with these measures it should give a 20% higher yield, and grassland a 40% improvement. The need for improved use of organic manures, especially of farmyard manure, is discussed.

(5) ASIA

(*See also* Abs. No. 2187)

[2337] (54)631.416.2 : 631.414.3
PATEL, D. K.; VISWANATH, B. **Comparative studies on Indian soils. II. Phosphate fixation capacities of soils.** *Indian J. Agric. Sci.* 16, 1946 (428-434). [Imp. Agric. Res. Inst., New Delhi]

The soils studied were classified as low, medium and hign in capacity for P fixation and the classes fall into geographical grouping. Those of low capacity are situated in Northern India from the Punjab to Assam, those of medium capacity comprise the North-West Frontier, part of Sind, the South-Eastern Central Provinces and Southern India, and those of high capacity are the black soils of the Central Provinces and Berar and soils of parts of Central India, Bombay and the Deccan. Maximum fixation is found with black colour and in semi-arid and humid areas. It is influenced by pH and highest at pH 7.0. Factors positively correlated with it are clay content, total exchange capacity, exchangeable bases, exchangeable Ca, HCl-soluble sesquioxides and Fe_2O_3. It decreases with the HCl-soluble silica/sesquioxide ratio.

[2338] (54)631.416.327
RAMAMOORTHY, B.; VISWANATH, B. **Comparative studies on Indian soils. 9. Minor or trace element status of Indian soils—spectroscopic estimation of boron contents.** *Indian J. Agric. Sci.* 16, 1946 (420-426). [Imp. Agric. Res. Inst., New Delhi]

The B content of Indian soils was found to be comparable with that of U.S.A. soils. It was lower in geologically old soils than in more recent ones. Cultivation in some cases increased and in others decreased—according to the local manurial treatment—the B content as compared with that of virgin soils. Similar variations in irrigated soils depended on the nature of the irrigation water.

[2339] (54)631.416.327 : 631.416.871.1
SASTRY, V. V. K.; VISWANATH, B. **Comparative studies on Indian soils. 10. Boron and manganese content of some Indian soils.** *Indian J. Agric. Sci.* 16, 1946 (426-428). [Imp. Agric. Res. Inst., New Delhi]

Samples of 20 Indian soils from 10 districts in Punjab, Sind and Bihar were examined for B and Mn content. Results are tabulated giving depth of sample and B and Mn contents in p.p.m. Amounts proved adequate and it is suggested that availability may be more important than quantity.

[2340] (54)633.18-1.81
KARUNAKAR, P. D.; RAJAGOPALAN, J. **Manuring of rice in relation to maintenance of soil fertility and increased production.** *Madras Agric. J.* 35, 1948 (211-215). Biol. Abs. 23 (1257).

Survey of possibilities with suggestion of demand on ingenuity of farmer.

[2341] (54)633.491-1.5
GUPTA, C. P.; LALL, G. **Manuring of potatoes for bigger yield to combat India's shortage for food crops.** *Allahabad Farmer* 22, 1948 (364-366).

Manurial schemes are given with other cultural directions for growing increased crops of potatoes in India, where two crops per year can be raised.

[2342] (548.7)631.434
JOACHIM, A. W. R.; PANDITTESEKERA, D. G. **Soil fertility studies. IV. Investigations on crumb structure and stability of local soils.** *Trop. Agricst.* 104, 1948 (119-129). [Dept. Agric., Ceylon]

Martin's water-sieving method for estimating crumb fractions greater than 0.5 mm. diameter has been modified to eliminate the sand and gravel found in many Ceylon soils. Limestone-derived soils of the Jaffna Peninsula were the least water-stable and the humic patana soils the most stable of 53 Ceylon soils studied. The patana soils had relatively more coarse fractions and the Jaffna soils and other dry-zone soils more finer fractions. True crumbs averaged 50% by weight of the crude crumbs except in humic and grassland soils where the percentage was higher. Jungle and forest soils were superior to those of cultivated or deforested highland areas. Grasses had a beneficial effect on structure. Cultivation reduced crumb content except in peaty loams of the patanas. Paddy soils varied considerably in water-stable aggregate content. Earthworm casts and termite-mound earth had better crumb structure than the soils from which they were derived.

[2343] (59)633.51-1.5
ANGLADETTE, A. Note sur la culture du cotonnier en Indochine. **[Note on cotton cultivation in Indochina.]** *Cot. Fib. Trop.* 3, 1948 (73-112). F.C. Abs. 2 (123). [F.]

(6) AFRICA

(*See also* Abs. Nos. 2051, 2093, 2094, 2135, 2293, 2294, 2295)

[2344] (6)631.44
PENDLETON, R. L. **What can be done to facilitate the classification of African soils?** *Bull. Agric. Congo Belge* 40, 1949 (153-158). [Johns Hopkins Univ., Baltimore]

Classification of soils can only be done effectively by soil mapping in the field supplemented by appropriate laboratory comparisons. It is not necessary to use pedologists; the mapping can be done by surveyors with varied training who can read maps and note colour and texture differences in a soil horizon. Types of soils in a number

of scattered surveys must be correlated and monoliths and soil descriptions should be exchanged between countries. In addition to detailed surveys of limited areas, reconnaissance soil surveys should be made of broad regions. Maps and reports should be published as soon as possible.

[2345] (61)634.975-1.4
FAUREL, L. Aperçu schématique sur les sols des cédraies de l'Afrique du Nord française. **[Outline of the cedar-forest soils of French North Africa.]** *C.R. Conf. Pédol. Méditerr. 1947*, 1948 (478-480]. [F.]

[2346] (624)631.452
JEWITT, T. N. **Soil-fertility studies in the Zande district of the Anglo-Egyptian Sudan.** *Comm. Bur. Soil Sci. Tech. Commun.* 46, 1949 (165-169). [Dept. Agric., A.-E. Sudan]

In the planned resettlement of the Zande, because of their remoteness, self sufficiency is the aim as a fertility-conserving measure. Over the 25,000 sq. miles, the main crops are eleusine and groundnuts under shifting cultivation; cotton, sugar, oil palm, coffee and timber are to be established. The variable soils, mainly of pH 5-6, are of an ironstone catena and have much pea-iron gravel in the upper few feet; the depth at which accumulations occur cannot be used for classification for agricultural purposes. Surface clay content varies around 20%; total P and K are low and felspar, in small amounts, is the only readily weathered mineral. Yields are low but do not suggest extreme exhaustion. Erosion, intensified by burning—even the early form now encouraged—is the main impediment to the maintenance of fertility. Due to tsetse, cattle cannot be used and composting and green manuring are too contrary to custom. Properly-applied shifting cultivation and fire prevention based on limited and carefully-sited early burning should allow the maintenance of fertility. The plantations envisaged will require the use of local refuse, cotton-seed meal, wood ashes, etc., and the effect of these on immediate fertility may at times be at variance with their relationship to the long-term problem.

[2347] (624)631.459 : 631.61
DEVAJDA, A. **Land and water problems in the Anglo-Egyptian Sudan.** *Soil Conservation* 14, 1949 (207-210). [S.C.S. Sudan]

Topography, climate, vegetation, agriculture and irrigation are discussed. Water supply is a great problem over millions of acres of good clay soil not yet utilized. A Soil Conservation Board and Service were formed in 1944. In the north of the country slowing down of runoff for conservation of soil moisture is being attempted. On the Red Sea coast water-spreading by the use of diversion dams is being used. In the central belt all rain is stored and old earth tanks are being revived. Burning is being controlled by regular fire lanes in the central area and in the forests of the north. In the south, forest reserves are being created.

[2348] (64)631.4
ALVIRA ALVIRA, T. Suelos de la zona norte del protectorado de España en Marruecos. **[Soils of the northern zone of Spanish Morocco.]** *An. Edafol. Fisiol. Veg.* 8, 1949 (3-31). [Sp.]

Data are given for soils and their clay fractions, sampled at various depths at 10 points scattered over the protectorate, of local climate, mechanical composition, pH, SiO_2, Al_2O_3, Fe_2O_3 and their ratios; TiO_2, CaO, MgO and base-exchange capacity, and the clay-dehydration curves are presented and shortly discussed. The zone includes a diversity of climatic conditions and geological formations and the soils include grey, podzolized grey, red Mediterranean, saline, *tirs* and calcareous desert, with one clearly lateritized and one strongly podzolized. See also *Soils and Fert.* X, p. 488 concerning physical characteristics.

[2349] (65)631.459 : 631.61
KILLIAN, C. **The degradation and protection of the soils in the pastures of the Algerian Steppes.** *Comm. Bur. Soil Sci. Tech.Commun.* 46, 1949 (192-195). [Bot. Lab., Univ. Algiers]

An overgrazed area of flat steppe country lying at 800-1000 m. altitude south of the Tell Atlas has been taken over by the Government for protection of the vegetation and soil for a number of years. The soil is encrusted by compacted layers and some salt

lakes occur. Average rainfall is 300 mm. which is insufficient for cereal cultivation and the people are pastoral nomads.

[2350] (66/67)633.18-1.5
L'AGRONOMIE TROPICALE. Le problème rizicole dans les territoires Africains de L'Union Française. **[The problem of rice cultivation in the African territories of the French Union.]** *Agron. Trop.* 4, 1949 (339-378). [F.]

The cultural methods existing under various conditions, the organization and present state of research and the future of rice production in these areas including Madagascar are discussed.

[2351] (66/67)634.771-1.4
BAEYENS, J. **Classifying banana soils in tropical West Africa.** *Comm. Bur. Soil Sci. Tech. Commun.* 46, 1949 (203-209). [Univ. Louvain]

The banana is a sensitive plant which grows well on deep clayey soil with good physical properties and a homogeneous profile well supplied with humus. It needs a lot of water, but is damaged by excess and the ground-water level should not be high. The climatic and water requirements and root system of the plant are described. Soils on which bananas grow well are able to carry the most exacting crops in the tropics.

[2352] (661)631.4
MAIGNIEN, R. **Morphology and distribution of brown and chestnut soils in Senegal, Mauritania and Sudan.** *Comm. Bur. Soil Sci. Tech. Commun.* 46, 1949 (35-39). [Office Colon. Sci. Res., France]

The approximate northern and southern limits of occurrence, climatic conditions, typical profiles and vegetation are described. The brown soils are rather shallow (100-150 cm.), of a uniform dull brown, with horizons distinguished only by structural differences including a few surface mm. of lamellar structure due to organic-matter accumulation and a granular structure more or less well developed in the upper part of the profile and degraded below. The chestnut soils differ from the brown in having a first beginning of coloration by free iron, a more distinct differentiation into horizons, with an A_1 horizon with structure only slightly developed, often degraded. The soils occur on very varied parent rocks.

[2353] (661)631.44(083.72)
AUBERT, G.; NEWSKY, B. **Note on the vernacular names of the soils of the Sudan and Senegal.** *Comm. Bur. Soil Sci. Tech. Commun.* 46, 1949 (107-109). [Office Colon. Sci. Res., France and Niger Office]

Cultivators recognize soil properties and use different names for different types of soils. Soils are differentiated according to regions, to possibility of inundated or dry cultivation, or of tillage with rudimentary implements or of producing such main crops as millet, groundnuts, etc.; such characteristics regularly correspond to difference in texture and structure of the upper horizons. Results of analysis by grain size and organic content confirm the distinctions adopted by the Africans. In pedological study, the use of these vernacular names has been of very great service; in particular, teams of Africans, supervised by European pedologists, have been successfully used in preparing a detailed cartography of soils to be developed.

[2354] (669)631.4
VINE, H. **Nigerian soils in relation to parent materials.** *Comm. Bur. Soil Sci. Tech. Commun.* 46, 1949 (22-29). [Dept. Agric., Nigeria]

Soil-profile features in Nigeria are mainly determined by geology—the nature of parent material, history of weathering and transportation of soil material. A provisional soil map of Nigeria differed from the geological map mainly in showing two groups of soils derived from transported parent materials which obscure the geological formations. These soils, which are described, consist of loose sands—the Northern Drift Group—and five sandy soils overlying Basement-Complex rocks—the Zaria Group.

[2355] (669)631.58 : 631.81
GREENWOOD, M. **Mixed farming and fertilizers in Northern Nigeria.** *Comm. Bur. Soil Sci. Tech. Commun.* 46, 1949 (170-173).

Conditions are suited to the institution of mixed farming as an alternative to shifting cultivation, and the provision of cattle is the main obstacle to rapid progress. The number of peasant farms may approach 3,000,000 of which 2,400,000 cannot be supplied with stock until it is shown that the

country can support a greater number of cattle. Meanwhile, fertility probably depends on the use of improved grass, tree or legume covers during the fallow and on increased production on the present acreage or the maintenance of present total production on a smaller acreage, both implying the use of fertilizers, which experiments so far suggest to be very profitable. Placement of super. for sorghum appears superior to spreading only when small quantities are used. With pellets of P fertilizers applied to groundnuts, the local method of toe and heel planting can be modified to drop the pellets a safe distance from the seed. Results so far indicate that 32-day-old seedlings 2 inches from a pellet are smaller than those ½ inch distant.

[2356] (675)63
PENDLETON, R. L. **The Belgian Congo: Impressions of a changing region.** *Geog. Rev.* 39, 1949 (371-400). [Johns Hopkins Univ., Baltimore]

[2357] (675)631.4
LIVENS, J. **Characteristics of some soils of the Belgian Congo.** *Comm. Bur. Soil Sci. Tech. Commun.* 46, 1949 (29-35). [INEAC]

The soils are described, and there is a brief discussion on the formation of laterite.

[2358] (676)631.471
ROBINSON, G. W. **Proposals by the late Geoffrey Milne for soil survey in East Africa.** *Comm. Bur. Soil Sci. Tech. Commun.* 46, 1949 (109-115).

A memorandum written in 1940 on desirable developments in soil survey in East Africa is quoted, largely *in extenso*. It makes the plea that a soil survey should come first on the list of necessary agricultural enquiries and should precede expenditure on matters that need it as a preparation. It includes proposals for an increase in the rate of progress of soil reconnaissance, the initiation of detailed soil surveys in selected areas, the study of the physical properties of soils in relation to erodibility and the study of clay constitution. The value of both reconnaissance surveys and surveys detailed enough to serve specific local purposes is pointed out and a list is given of areas where detailed surveys should be begun. Proposals for staffing and organization are included.

[2359] (676.1)631.4
GRIFFITH, G. AP **Provisional account of the soils of Uganda.** *Comm. Bur. Soil Sci. Tech. Commun.* 46, 1949 (16-21). [Uganda Dept. Agric.]

The soils are classified as zonal, intrazonal and azonal, and descriptions of their occurrence, parent material, topography, climate, vegetation and crops are tabulated.

[2360] (676.1)631.452
GRIFFITH, G. AP **Fertility problems in Uganda.** *Comm. Bur. Soil Sci. Tech. Commun.* 46, 1949 (160-165). [Dept. Agric., Uganda]

Due to transport difficulties, the import of fertilizer is expensive and unlikely to increase in the near future. Large responses have been shown only to N fertilizers, but dry-season accumulations of NO_3-N are recorded which, if advantage can be taken of them, may replace heavy dressings of N. Natural regeneration or a grass rest under regularized shifting cultivation are an interim answer to the problem of maintaining fertility, mainly by reducing erosion, mobilizing reserves and improving organic-matter content and structure. The conservation and proper use of the following locally-available fertilizers are discussed: cotton seed, cattle manure, composts, grass and vegetable mulches and rock phosphate.

[2361] (676.1)631.47
EGGELING, W. J. **Land utilization with special reference to forestry.** *Emp. Forestry J.* 28, 1949 (38-42). [Forestry Dept., Uganda]

Land utilization for production and protection forests in Uganda is discussed.

[2362] (676.1)631.851
DAVIES, K. A. **The phosphate deposits of Eastern Uganda.** *Comm. Bur. Soil Sci. Tech. Commun.* 46, 1949 (173-178). [Geol. Surv., Uganda]

The original mineral is a hydroxy fluorapatite of comparatively low F content and of low availability but, due to weathering, ⅘ of the surface phosphate is francolite, which has been used in Kenya soils with considerable effect, although much larger quantities are required than of guano. Beneficiated rock contains too much Fe and Al to permit the manufacture of super. and experiments are

proceeding in the groundnut area with a simply-produced Rhenania type of phosphate. The supply of fertilizers to all parts of East Africa is made difficult by distance, scattered population and inadequate transport, and it is suggested that production should be of concentrated products sucn as elemental P and phosphoric acid, and also of NH_3 and NH_4 phosphate when hydroelectric power is available at Jinja. The geological associations of phosphatic rocks and the possibility of occurrence elsewhere in East and South Africa are discussed.

[2363] (676.2/9)631.44
JONES, G. H. G. **Colonial soil types: systematic soil classification and nomenclature.** *Comm. Bur. Soil Sci. Tech. Commun.* 46, 1949 (85-93). [Kenya Colony]

The suggestions for soil classification are made for the purpose of discussion. There is a danger that soil workers should attempt to fit in local soils with what they consider to be the most likely soil types described by other workers. The need for some authority to direct this type of work in the colonies is stressed.

A tentative system is suggested for the classification of soil types in Kenya Colony. Hardly any soil analyses of non-agronomic value have been undertaken, and mineralogical and chemical data required for a sound classification are scarce. Soil series based mainly on topography, parent material, mode of formation and morphology of the soil profile are suggested as a unit of classification. About 60 soil series in Kenya have been classified, named and described. The use of the term "fasc" is recommended for a group of soil series that have a dominant soil factor in common, and of the catena for the mapping of a sequence of geographically associated complexes. Examples of 4 catenas in Kenya occurring in areas of similar and dissimilar lithology are described. The leached zonal soils of Kenya are grouped into lithological and truncated soils. The former are divided into skeletal soils with little or no chemical decomposition, but a varying amount of mechanical decomposition, and lithosols with further chemical decomposition resulting in the formation of mineral colloids, although most of the original minerals are still recognizable. Recently eroded soils may be classified either with their original series or as lithosols or skeletal soils.

[2364] (676.2/9)631.459 : 631.61
MAHER, C. **Observations on some soil-conservation problems in Kenya Colony.** *Comm. Bur. Soil Sci. Tech. Commun.* 46, 1949 (198-203). [S.C.S., Dept. Agric., Kenya Colony]

The extent of soil erosion in pastoral and arable areas of Kenya is described. Soil-conservation work in European areas on heavy soils with high clay content, light sandy soils and immature ash soils is discussed. Erosion is most serious on areas of deep red earths derived from gneiss and mica schists where the organic matter and mineral nutrients are low; on these areas poor pioneer grasses have been unable to form a complete cover in 10-15 years and better seed is to be tried. Land-use planning as applied to the European areas in Kenya has not been applied to any native areas already populated, because of overcrowding, subdivision of land, lack of machinery and conservatism of the people.

[2365] (677)633.51
RAINEY, R. C. **Cotton in Ethiopia and the Somalilands.** *Emp. Cott. Grow. Rev.* 26, 1949 (186-195).

The influence of climate, soil and irrigation on cotton yield in various districts is discussed. The low yields from the Webbe Shibeli basin are considered due to high salinity, especially at flooding time, the water having a particularly high Cl content. The importance of light irrigation and of fallow is indicated. The heavy, deep, alkaline clays of Villagio and Gezira produced good yields, the latter benefiting from Blue Nile water.

[2366] (678)631.47 : 631.44
ROUNCE, N. V. **Soil classification and survey in relation to land rehabilitation and expansion in Usukuma.** *Comm. Bur. Soil Sci. Tech. Commun.* 46, 1949 (121-124). [Dept. Agric., Tanganyika]

Over £500,000 is being spent in the next 10 years on a scheme to deal with the over-population of the 10,000 square miles of the Usukuma area of the cultivation steppe of Tanganyika by extending cultivation into 4,000 sq. m. of unoccupied land and ensuring suitable cultivation of both the new land and that already in use. The importance of prior soil survey in the planning of settlement and reasonable land use is discussed and emphasized.

[2367] (678.1)631.4
CALTON, W. E. **A reconnaissance of the soils of Zanzibar Protectorate.** *Comm. Bur. Soil Sci. Tech.Commun.* 46, 1949 (49-53). [Dept. Agric., Zanzibar]

Three factors, (a) maturity, (b) drainage conditions and (c) parent material which dominate soil-forming processes are used as soil-classifying criteria. Under (a) falls a maturity sequence of red or reddish very well draining soils derived from limestone and possibly akin to *terra rossa*. Occasional rather less efficient drainage conditions may produce yellowish-brown sandy and brown variants. Under (b) are deep red-earth types of non-calcareous sediments, degree of maturity here playing a minor part compared with drainage conditions. Under (c) are rendzinas and heavy clays which are inherently sluggishly draining due to the nature of their parent material.

[2368] (68.01)63
FARMER'S WEEKLY SOUTH AFRICA. **Natural farming regions of Transvaal.** *Farm. Week. S. Africa* 76, April 6, 1949 (52-57, 113).

The Transvaal is divided into 18 regions for each of which the climate and natural vegetation are described and systems of agriculture are recommended.

[2369] (68.01)631.4
VAN DER MERWE, C. R. **South African soil types.** *Comm. Bur. Soil Sci. Tech. Commun.* 46, 1949 (8-15). [Dept. Agric., Pretoria]

Soils of four soil zones are described, viz:—brown forest soils, grey ferruginous lateritic soils, sub-tropical black clays, and laterite, lateritic red and lateritic yellow earths.

[2370] (68.01)631.432
FARMER'S WEEKLY SOUTH AFRICA. **Rainwater percolation determined by vegetal cover.** *Farm. Week. S. Africa* 76, May 4, 1949 (93).

Lysimeter studies by J. J. Theron for 17 years are described. The chief reason for the drying-up of water supplies is the practice of keeping the veld short and using it as fodder. Theron recommends the re-establishment of veld vegetation that will produce sufficient coarse grass to limit evaporation, runoff and erosion to a minimum and to bind the soil. "Sponge" areas should be established on which there should be no grazing or burning.

[2371] (68.01)631.81
WALTERS, M. M. **Karroo soils need little fertiliser.** *Farm. Week. S. Africa* 76, July 13, 1949 (89). [Coll. Agric., Grootfontein, C.P.]

On alluvial clayey loams application of fertilizers and kraal manure did not appreciably increase the lucerne crop over 7 years. $(NH_4)_2SO_4$ did not increase hay or wheat, oats and barley for grazing. On colluvial sandy loams application of $(NH_4)_2SO_4$, compost, kraal manure or super.+manure or compost increased maize and winter grazing, but are not economic. Super. alone or K fertilizers were not beneficial. Application of 20 tons/morgen of compost or kraal manure or 10 tons/morgen together with 400 lb. of super. increased considerably the yield of potatoes.

[2372] (68.01)633.367
HENNING, P. D. **Lupines in the winter-rainfall area.** *Farm. S. Africa* 24, 1949 (227-230). [Stellenbosch-Elsenburg Coll. Agric.]

Soil and climatic requirements, fertilizers, seed inoculation, time and rate of seeding, and utilization are discussed.

[2373] (689.1)631.459 : 631.61
BOND, W. E. **Soil conservation and land use planning in native reserves in Southern Rhodesia.** *Trop. Agric. Trin.* 25, 1948 (4-13).

The extent and main causes of soil erosion in Southern Rhodesia are described, together with measures already adopted to deal with the problem. Preventive operations are urged, including contour cultivation and planting, with grass buffer strips at intervals, humus maintenance by various methods, control of distribution and movements of livestock, also of road alignment and drainage, restriction of transport to wheeled vehicles and conservation of woodlands on steep slopes.

[2374] (691)631.4
HÉNIN, S. **Madagascan soils.** *Comm. Bur. Soil Sci. Tech.Commun.* 46, 1949 (40-43). [Soil Lab., Versailles]

The plateau and coast to the west of the mountain chain receive rain during half the year, the amount decreasing southward from 150-250 cm. down to 30 cm. on the south-west coast. The east coast receives 150-350 cm. rather irregularly distributed throughout the year. Over the central zone of eruptive and metamorphic rock, laterites extend as far south as the 100 -cm.isohyet, those under grassland often having cuirasses. On the boundaries of the lateritic zone, soils resembling brown and leached brown soils occur. Outside this zone, and sometimes on recent alluvia within it, occur podzols (at about 2000 m.), and humous podzols on siliceous formations both in the east and in the mountain zone. Rendzina-like soils occur in small depressions on calcareous formations on the west coast, and soils resembling *terra rossa* on the same formations. In the south and south-west red and black sandy soils are very extensive and ferruginous or calcareous crusts are often found, especially on the small plateaux.

Water erosion is intense. In the laterite area the whole system of conservation must aim at preserving the carapace intact, as vast ravines or *lavakas* are formed on the upper parts of hillsides wherever water penetrates the carapace and carries the more open lower layers away.

[2375] (698.2)633.61-1.415
MARTIN-LEAKE, H. **Biochemical control in Mauritius.** *Int. Sug. J.* 51, 1949 (245).

Details are given of foliar-diagnosis investigations on one variety of sugar cane, the results showing that marked deficiencies of N and K occur in Mauritius soils, and low levels of N, P and K under peasant cultivation.

(7) NORTH AND CENTRAL AMERICA

[2376] (71)632.191
HILL, H. **Minor element deficiencies affecting Canadian crop production.** *Sci. Agric.* 29, 1949 (376-383). [Cent. Expt. Farm, Ottawa]

Work on B deficiency in apples and other fruits, turnips, lucerne, celery and carrots, and on Cu, Co, Fe, Mn, Zn, Mo and Mg deficiency in various parts of Canada is reviewed. 38 references are given.

[2377] (711)631.4 : 551
BRINK, V. C.; FARSTAD, L. **The physiography of the agricultural areas of British Colombia.** *Sci. Agric.* 29, 1949 (273-301). [Univ. British Colombia, Vancouver]

[2378] (72)63
HIGBEE, E. **Agriculture in the Maya homeland.** *Geog. Rev.* 38, 1948 (457-464). Biol. Abs. 23 (1266). [Johns Hopkins Univ.]

[2379] (728.6)631.47
LEON, J. **Land utilization in Costa Rica.** *Geog. Rev.* 38, 1948 (444-456). Biol. Abs. 23 (1268). [Inter-Amer. Inst. Agric. Sci., Turialba, Costa Rica]

[2380] (729)631.44
HARDY, F. **Soil classification in the Caribbean region (a review).** *Comm. Bur. Soil Sci. Tech. Commun.* 46, 1949 (64-75).

The various systems of classification applied during the past 20 years in this region are brought together. The islands for which relevant data are available are Cuba, Jamaica, Puerto Rico, Trinidad, Antigua with Barbuda, and St. Croix: mainland areas are represented by British Honduras. Classification has mainly been based on the kind of parent material, but in some schemes the soils of hilly lands are differentiated from those of flat lands and in others the parent material and topography have been combined, inasmuch as they determine the degree of drainage, thus facilitating subdivision into soils developed under free, partially impeded and fully impeded drainage. An attempt is made to co ordinate some of the soil suites of the British investigators with World soil groups, distinguished by American workers, as represented in Puerto Rico. Most of the world groups seem to occur within the areas surveyed, though their subdivision into zonal, intrazonal and azonal may not sufficiently stress the importance of parent rock and topography, which appear predominant in soil formation in this region.

[2381] (729.5)631.44
BONNET, J. A. **Broad classification of tropical soils in Puerto Rico by various practical systems.** *Comm. Bur. Soil Sci. Tech. Commun.* 46, 1949 (103-106). [Agric. Expt. Sta., Univ. P. R., Rio Piedras]

The soils have been classified into 117 soil series including 352 types and phases. The areas of these soil types are presented grouped according to physiographic regions, land-utilization classes, productivity ratings, texture classes and international soil groups. Such broad classifications are of value for adequate comparison with other tropical countries.

[2382] (73)631.432
PARKER, G. G. **Ground-water situation of the United States.** *Soil Conservation* 15, 1949 (53-58). [U.S. Geol. Surv., Washington, D.C.]

A map shows areas of known heavy ground-water withdrawals, areas for which substantial ground-water data are available, areas in which quantitative studies have been made, and estimated pumpage by States in 1945. Irrigation with ground water is rapidly increasing and in drier areas serious ground-water shortages occur.

[2383] (73)631.47
RAYCHAUDHURI, S. P. **Soil conservation survey and land use classification.** *Indian Farm.* 10, 1949 (138-143). [Min. Agric., India]

The soil-conservation survey and land-use-classification survey of U.S.A. are described.

[2384] (73)631.81
DAVIS, R. O. E. **Forty years of fertilizer research [in the U.S.A.].** *Chem. Engng. News* 27, 1949 (410-412]. B.A.BIII, 1949 (221).

[2385] (74)631.44
CLINE, M. G. **Profile studies of normal soils of New York: I. Soil profile sequences involving brown forest, gray-brown podzolic, and brown podzolic soils.** *Soil Sci.* 68, 1949 (259-272).

Profiles of the (1) brown forest, (2) grey-brown podzolic, (3) brown podzolic and (4) podzol type occur in normal positions in New York. (1) and (2) are restricted to basic parent material and (3) and (4) to acidic. Differences of present vegetation are associated with these differences in parent material. The distribution of (2) and (3) is not correlated with measured differences in climate. A continuous geographical sequence is described from (1) to (3) for a continuous series of parent materials of progressively decreasing carbonate content, and there is evidence that some of (3) have formed in the solums of former type-2 profiles. A working hypothesis is presented that the sequence may be duplicated by a chronological succession of profiles where loss of bases by leaching is not offset by the return of bases by vegetation.

[2386] (75)631.613
HALL, A. R. **Terracing in the southern Piedmont.** *Agric. Hist.* 23, 1949 (96-109).

Many of the early American trials of mechanical erosion control were made in the southern Piedmont of Virginia, the Carolinas and Georgia. Horse ploughing, hillside ditching, and the development of horizontal bench terraces and broad-base terraces are discussed.

[2387] (76)633.61-1.5
TURNER, P. E. **The Louisiana system of sugar-cane cultivation.** *Trop. Agric. Trin.* 25, 1948 (33-37).

Climate, soils and topography are described for the Louisiana sugar-cane areas and briefly compared with Trinidad.

Louisiana sugar-growing soils range from light silty loams to silty clays, some with a water table, but this is more than one foot below the water-furrow bottoms. Drainage presents difficulties in the heavier soils and their production is below capacity.

A maize crop interplanted with soybeans precedes the planting of sugar. Maize stubble and the cover crop are ploughed in one month before planting sugar. These operations would be impracticable in Trinidad.

[2388] (76)633.71-1.81
BORTNER, C. E. **Fertilization of burley tobacco.** *Proc. Natl. Joint Cttee Fert. Appl. 1947*, 23, 1948 (251-253). Biol. Abs. 23 (1258). [Agric. Expt. Sta., Lexington, Ky.]

A brief discussion of tobacco fertilization practices and problems in Kentucky.

[2389] (77)631.468.516
EVANS, A. C. **On some earthworms from Iowa, including a description of a new species.** *Ann. Mag. Nat. Hist.* 14, 1947 (514-516).

Collections of earthworms from brown silt loam, black clay loam and light brown silt loam in different localities in Iowa are tabulated for species, and the scarcity of night-feeding species is noted. The new species, *Allolobophora iowiana* is described in detail and compared with closely related species.

[2390] (77)631.473
MCMILLER, P. R. **Principal soil regions of Minnesota.** *Minn. Agric. Expt. Sta. Bull.* 392, 1947, pp. 48.

[2391] (77)633.63-1.81
ROST, C. O.; KRAMER, H. W.; MCCALL, T. M. **Fertilization of sugar beets in the Red River Valley.** *Minn. Agric. Expt. Sta. Bull.* 399, 1948, pp. 14.

Response to fertilizing was lacking in 6% of the fields used. In 37%, P alone gave an increase. These fields had been the least productive ones without fertilizers. A mixture of P and K, or K alone, gave maximum yields in about 57% of the fields. There was little response to N.

[2392] (79)631.67
ALTHOUSE, I. H. **Water and irrigation needs of the Pacific Coast.** *Agric. Engng.* 30, 1949 (387-389).

[2393] (79)633.2.03-1.67
JONES, B. J.; BROWN, J. B. **Irrigated pastures in California.** *Calif. Agric. Ext. Serv. Circ.* 125, 1949, pp. 57.

The most suitable soils are fine textured or those with underlying hardpan or clay, formerly held as valueless for irrigated farming. Strip-check irrigation is best for gently sloping land and fine-textured soils, but necessitates extensive preparation. Contour checks are best for flat land. Sprinkling is profitable where other methods are impracticable or uneconomic.

[2394] (79)633.491-1.5
DAVIS, G. N. **Growing potatoes in California.** *Calif. Agric. Ext. Serv. Circ.* 154, 1949, pp. 23. [Coll. Agric., Univ. Calif., Berkeley]

[2395] (79)634.75-1.5
BAKER, R. E. **Growing strawberries in the home garden.** *Calif. Agric. Ext. Serv. Circ.* 151, 1949, pp. 15. [Univ. Calif., Berkeley]

(8) SOUTH AMERICA

(*See also* Abs. No. 2002)

[2396] (81)631.4
SETZER, J. Algumas contribuições geológicas dos estudos de solos realizados no Estado de São Paulo. [**Some contributions to geological knowledge from soil studies in San Paulo State.**] *Rev. Brasil. Geog.* 10, 1948 (41-104). [Pt.f.sp.i.e.g.esp.]

About 50 physical and chemical characteristics are presented for soils derived from calciferous and non-calciferous Bauru sandstones and from Botucatu sandstone influenced by basaltic lavas. Analyses of the lavas and their weathering layers and soils indicate the existence of a point during decomposition at which the SiO_2 content becomes zero. Humus, in virgin terra roxa, provides colloid protection for about 10% of SiO_2, this amount decreasing with the humus content. Beginning with the exfoliation layer free of red coloration, the SiO_2 content increases, reaching 50% in the rock, with $Fe^{\cdot\cdot}$ also increasing and $Fe^{\cdot\cdot\cdot}$ decreasing. A diagram of Vageler's triangular projection SiO_2 - Al_2O_3 - Fe_2O_3 was applied to the analysis results for the mineral colloids of the various soils, and these fell within definite regions of the projection. Earlier mapping was on a basis of features of soils which were not analysed: the present complete analyses throw light on such questions as the distinguishing of geological formations and their mapping.

[2397] (81)633.11-1.5
SETZER, J. O Estado de São Paulo pode produzir trigo. [**Possibilities of wheat production in the State of São Paulo.**] *Rev. Fazend.* 11, 1949 (15-17). [Pt.]

Wheat cannot be grown in summer, which is too hot and rainy. The beginning of autumn (March) is the best time for wheat planting. Germination is always good due to high moisture content of the soil and high temperatures. From then on, the temperature declines till the harvest time, but a more serious impediment is lack of rain

during the winter. In 20 years reasonable harvests were obtained in 6, poor harvests in 7, and none in 7. The conclusion is that wheat cannot be grown without irrigation. The wide level valley floors lying between sierras with high rainfall can be irrigated by gravity, but the soils are too acid for wheat. The author states that successful wheat production could be achieved after some 5 to 10 years of heavy liming of the alluvial soils of the Paraíba and other similar valleys. A system of drainage and irrigation is needed in order to maintain the root tips some 30 cm. above the water table.—J.S.

[2398] (81)633.52-1.5
FERREIRA, J. C., JR. Cultura do linho (*Linum usitatissimum* L.). **[The cultivation of flax (*Linum usitatissimum L.*).]** *Agronomia, Rio de J.* 7, 1948 (3-19). F.C. Abs. 2 (124). [Pt.] [Esc. Nac. Agron., Univ. Rur., Rio de Janeiro]

Sowing, cultural operations, manuring and harvesting of flax are described for both seed and fibre production.

[2399] (899)631.613
MOLINELLI, J. C. Sistematización por medio de terrazas de predios destinados a la agricultura. **[Systematization by terracing of land destined for agriculture.]** *Min. Ganad. Agric. Uruguay Dir. Agron. Pub.* 93, 1948, pp. 49. [Sp.]

Various types of terracing and drainage are discussed, with diagrams and engineering formulae.

(9) OCEANIA

(*See also* Abs. Nos. 2254, 2278)

[2400] (9)631.4
GRANGE, L. I. **Soils of some South Pacific islands.** *Comm. Bur. Soil Sci. Tech. Commun.* 46, 1949 (45-48).

Chemical and profile data are presented for the soils of Western Samoa, the Solomon Islands, New Caledonia and Niue Island, together with soil notes concerning Norfolk and Raoul Islands, the Cook Islands and Tonga.

[2401] (914)631.4
MARIANO, J. A. **The agricultural soils of Davao.** *J. Soil Sci. Soc. Philipp.* 1, 1949 (56-61).

These soils of the as yet hardly settled Davao province of Mindanao are classified into 3 series of plain and 5 of hill and upland soils. Characteristics, area covered and suitable crops are recorded for each series.

[2402] (914)631.47 : 631.459
MAMISAO, J. P. **Land-use planning for soil conservation farming.** *J. Soil Sci. Soc. Philipp.* 1, 1949 (47-54).

The soil of about 30% of the total land area of the Philippines, or 76% of the agricultural area, has been or is being destroyed by erosion. The official nine land-use-capability classes are based mainly on slope, but also on present fertility, degree of erosion, etc. The old and revised land uses on a 30-ha. farm are described.

[2403] (92)631.44
DAMES, T. W. G. **Some notes on the soil survey of Java.** *Comm. Bur. Soil Sci. Tech. Commun.* 46, 1949 (115-120). [Inst. Soil Res., Buitenzorg]

The mapping unit is the soil "species" which is determined by profile characters. "Species" differing only quantitatively are grouped into a soil "type". Both units are natural products, discernible in the field and mappable by soil survey. There is no attempt to fit the units into an international system, since there is insufficient knowledge of the relationships with other tropical soils.

Samples undergo detailed laboratory study. Mechanical composition is determined by the U.S. Bureau of Soils method extended by Mohr, which is more suitable for tropical soils than the I.S.S.S. methods. The sand and clay fractions are analysed microscopically and by X-ray respectively, to indicate parent materials, mineral reserves, etc. Practically no soil in Java is derived from one single parent material and the soils often have no relationship with the underlying rock. From the Atterberg values, values for plasticity, tillability and maximal water-holding capacity are derived.

Except for mountain soils, the influence of the parent rock and the land surface predominates over the influence of the small climatic variations. Ten main soil "types" are described:—volcanic-ash, lateritic, mountain, margalite, limestone, marsh, quartz, peat and sedimentary soils and bleached earths. As regards nomenclature, circumscriptive names only are used, expressing the soil type, parent material, pedological age and colour, e.g., "light-brown older basaltic ash-sand".

[2404] (92)631.459 : 631.61
EDELMAN, C. H. **Conservation of soil fertility in the Netherlands Indies.** *Comm. Bur. Soil Sci. Tech. Commun.* 46, 1949 (195-198).

In 1847 terracing of slopes in Java was made compulsory and the public ownership of all land not claimed was declared. By this declaration the reclamation of virgin lands was brought under control. Forest reserves were made about 60 years ago. On red lateritic soils, leguminous plants developed poorly until it was found that they reacted to cheap rock phosphate. The problem of conservation of soil fertility on European plantations has now been solved in principle and in practice. On unirrigated land of the native population shifting cultivation using only short fallow periods has led to serious erosion. A Soil Conservation Service was planned in 1938 and established after the war. Extensive forests have been devastated and mismanaged during the last 7 years.

[2405] (92)634.975-1.4
BOTTENBURG, M. VAN Sumatra's pijnbosch. **[Sumatra's pine forests.]** *Landbouwk. Tijdschr.* 711-712, 1947 (352-358). Biol. Abs. 23 (1298). [Du.]

Pinus merkusii in Sumatra thrives on poor worn-out soils; on fertile soils young seedlings are usually suffocated by other woody spp. It requires the presence of *Boletus* in the soil and gives excellent results on denuded forest soils.

[2406] (931)631.855 : 552.47
GRIMMETT, R. E. R.; ELLIOTT, I. L. **Production of serpentine superphosphate in New Zealand.** *Amer. Fert.* 110, No. 11, 1949 (9-10, 28, 30, 32). C.A. 43 (5892).

[2407] (931)634.7-1.5
JUNE, R. I. **Production of small fruits increasing in Hawke's Bay.** *N.Z. J. Agric.* 78, 1949 (619-624). [Dept. Agric. Hastings]

[2408] (931)635.25-1.5
VINEY, R. **Onion growing in Hawke's Bay. Methods employed for large-scale production on Mangateretere farm.** *N.Z. J. Agric.* 78, 1949 (614-615). [Dept. Agric. Hastings]

[2409] (94)63.001.89
PRESCOTT, J. A. **The Waite Agricultural Research Institute, Australia.** *Research* 2, 1949 (373-377).

The origin, function and work of the Institute are described.

[2410] (94)631.445.7
STEPHENS, C. G. **A review of recent work on Australian tropical and sub-tropical soils.** *Comm. Bur. Soil Sci. Tech. Commun.* 46, 1949 (1-8).

18 major soil categories are distinguished for Australia as a whole, of many of which the counterparts have not yet been recognized in other continents. Their mode of occurrence is briefly discussed, and some twenty different types of profiles are described. The opinion is expressed that Australian tropical soils do not require a genetic classification different from that given to soils in the southern part of the continent.

[2411] (941)633.13-1.81
DUNNE, T. C.; SMITH, S. T.; CARISS, H. G. **Responses of oats to zinc, phosphate and copper on newly cleared light land in Western Australia.** *J. Agric. W. Aust.* 26, 1949 (75-82).

In widely separated centres in Western Australia, oats responded markedly in growth and grain yield to the use of Zn fertilizers. Without Zn, deficiency symptoms (differing from those reported from South Australia) were evident, including stunted growth and dark bronzed lower leaves. ZnO at 3 lb./acre or $ZnSO_4$ at 8 lb./acre are suitable applications. Similar effects were obtained with Wimmera ryegrass but wheat seemed unaffected by Zn deficiency. Super. at 2 cwt./acre gave oat yields greatly superior to those from 1 cwt./acre.

In one locality (Kojonup) Cu deficiency was suggested by the improvement in oat yield effected by Cu fertilizers. Applications of 5 lb./acre of $CuSO_4$ or 12½ lb./acre of Cu ore are recommended for first cereal crops on cleared land.

[2412] (942)631.613
SYVERSTON, C. **Soil Conservation by contour banking.** *J. Dept. Agric. S. Aust.* 52, 1949 (554-555).

The solution of an erosion problem at Yadnarie, Eyre Peninsula, S. Australia, is described.

[2413] (945)634.51-1.5
GAYFORD, G. W. **Walnut growing in Victoria.** *J. Dept. Agric. Victoria* 47, 1949 (311-312).

[2414] (961)631.4
BLACKIE, W. J. **Soils of Fiji.** *Comm. Bur. Soil Sci. Tech. Commun.* 46, 1949 (54-58). [Dept. Agric., Fiji]

Fijian soils, most of which are unused, have developed under rather subtropical temperature and vegetation and rather tropical rainfall conditions. They are very young, particularly in the dry zones, and their pattern closely follows the complex geological pattern more or less modified by topography, climate and vegetation. From available information the following broad groupings and their subdivisions are offered and discussed:—

Zonal Soils. (a) Red Loams. Red and Brown Earths of the continuous-rainfall belt. The dominant feature is the absence of marked colour change from surface to parent rock. Structure varies from loosely-compacted to compacted in the surface soils. No concretions have been observed under tall forest. Surface pH is 4.5-5.2 increasing with depth to 6.5. The looser soils are good agricultural types. (b) Red and Brown Earths and lateritic soils of the interrupted-rainfall belt. These are usually loosely compacted, of pH 6-6.5, have a fair to moderate nutrient status and are suited to cattle farming and as second-class sugar-cane soils.

Intrazonal soils. (1) Alluvial and colluvial soils including coastal-plain soils and those with impeded drainage. The first two include the most important agricultural soils: they are sandy loams to silty clay loams, deficient in lime, well supplied with available and reserve P and K. Structure is improved by liming to pH 6, by organic and green manuring. Proper drainage is all-important in the management of the compacted silty-clay loams. (2) Mountain soils, one or a few inches deep and of a nut-like structure in the dry season, brown to black, and without agricultural importance.

[2415] (961)631.44
SMYTHE, L. E. **Soil science in Fiji, V and VI. Problems of soil classification in Fiji.** *Fiji Agric. J.* 19, 1948 (82-87).

Schemes of soil classification are discussed and problems of classification in Fiji are examined. Lack of aerial photographic data, topographic maps and accurate climatic and geological data handicaps soil classification. Soil types and associations have been mapped in Viti Levu and a programme of work on land use and erosion control is presented.

RECENT BOOKS

631.422 DAWSON, R. F.
Soils Testing Manual. Pitman Publishing Corporation, New York. 1949. Pp. 160.

631.432 : 551.49 UNITED STATES DEPARTMENT OF AGRICULTURE.
Handbook for Preliminary Examinations and Surveys of Watersheds for Runoff and Waterflow Retardation and Soil Erosion Prevention in the Interest of Flood Control. U.S.D.A., Washington. 1947. Pp. 102.

631.432 : 551.49 MEINZER, O. E. (EDITOR).
Hydrology. Dover Publications, New York. (Third impression of first edition, published 1942). 1949. Pp. 712. $4.95.

631.432 : 551.49 WISLER, C. O.; BRATER, E. F.
Hydrology. Chapman and Hall, London. $6.00.

631.459 : 631.61 : 634.9
NATIONAL PLANNING COMMITTEE, INDIA.
Soil Conservation and Afforestation. Vora & Co. Ltd., Bombay. 1949. Pp. 195.

631.459 : 631.61 : 634.9 WAGNER, H. O.; LENZ, H.
El Bosque y la Conservación del Suelo, su Importancia Cultural y Económica. [The Forest and Soil Conservation, its Cultural and Economic Importance.] Editorial Cultura, Mexico. 1948. Pp. 169. [Sp.]

631.51 CAREW, N.
Ploughman's Wisdom. Faber and Faber, London. 1949. Pp. 167. 15s. od.

632 BIOLOGISCHE ZENTRALANSTALT FÜR LAND-UND FORSTWIRTSCHAFT.
Festschrift zum fünfzigjährigen Bestehen der Biologischen Zentralanstalt für Land- und Forstwirtschaft in Berlin-Dahlem. [Celebratory volume for the 50th anniversary of the Central Biological Institute for Agriculture and Forestry, Berlin-Dahlem.] Deutsche Zentralverlag, Berlin. 1949. Pp. 232.

633.71 MURRAY, S. S.
Report on Tobacco with Particular Reference to the Prospects of Increased Production in Central and East Africa. Colonial Research Publication No. 4. Colonial Office, London. 1948. Pp. 99. 2s. od.

633.832-1.5 TIDBURY, G. E.
The Clove Tree. Crosby Lockwood & Son, Ltd., London. 1949. Pp. 212. 18s. od.

634.37 CONDIT, I. J.
The Fig. Chronica Botanica Co., Waltham, Mass. 1948. Pp. 222. $5.

(689)551.48/49 DEBENHAM, F.
Report on the Water Resources of the Bechuanaland Protectorate, Northern Rhodesia, the Nyasaland Protectorate, Tanganyika Territory, Kenya and the Uganda Protectorate. Colonial Research Publication No. 2. Colonial Office, London. 1948. Pp. 85. 10s. 6d.

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COMMONWEALTH BUREAU OF SOIL SCIENCE

PAMPHLETS AND REPRINTS OBTAINABLE ON LOAN

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MISCELLANEOUS

6180. 016 : 63
FRYKHOLM, L. Översikt över lantbruksforskningens och dess hjälpvetenskapers viktigare bibliografiska hjälpmedel. **[Review of the more important bibliographical guides to agricultural research and its ancillary sciences.]** *Kgl. Lantbr-Akad. Tidskr.* 87, 1948 (459-489). [Sw.]

6150. 546.73 : 619
TOSIC, J.; MITCHELL, R. L. **Concentration of cobalt by micro-organisms and its relation to cobalt deficiency in sheep.** *Nature* 162, 1948 (502).

6042. 551.5.005
RAMDAS, L. A. **Some new instruments and experimental techniques developed in the Agricultural Meteorology section at Poona.** *J. Sci. Indust. Res. (India)* 7, 1948 (16-29).

6083. 551.58
SETZER, J. **A new formula for precipitation effectiveness.** *Geog. Rev.* 36, No. 2, 1946 (247-263).

631.41 SOIL CHEMISTRY

6183. 631.413 : 631.415.1
SCHOFIELD, R. K. **Effect of pH on electric charges carried by clay particles.** *J. Soil Sci.* 1, 1949 (1-8).

6054. 631.414.1
RAMDAS, L. A.; MALLIK, A. K. **Studies on soils. III. On the effect of concentration of some salts in aqueous solution on capillary ascent, dispersion and associated phenomena in the black cotton soil.** *Proc. Indian Acad. Sci.* 26A. 1947 (1-12).

6108. 631.414.1 : 631.432.3
BOUYOUCOS, G. J. **Capillary rise of moisture in soil under field conditions as studied by the electrical resistance of plaster of paris blocks.** *Soil Sci.* 64, 1947 (71-81).

6154. 631.414.2 : 549
MACEWAN, D. M. C. **Complex formation between montmorillonite and halloysite and certain organic liquids.** *Trans. Faraday Soc.* 44, 1948 (349-367).

6153. 631.414.2 : 549
MACKENZIE, R. C. **Investigation of the ethylene glycol-water-montmorillonite system using the Karl Fischer reagent.** *Trans. Faraday Soc.* 44, 1948 (368-375).

6115. 631.414.2 : 549
WEAR, J. I.; STECKEL, J. E.; FRIED, M. ET AL. **Clay mineral models : construction and implications.** *Soil Sci.* 66, 1948 (111-117).

6147. 631.414.3 : 631.811
SINGH, D.; CHAWLA, D. R. **Base-exchange studies. II. Variation in the content of exchangeable bases affecting plant growth.** *Indian J. Agric. Sci.* 13, 1943 (368-376).

6053. 631.415.3 : 631.432.3
RAMDAS, L. A.; MALLIK, A. K. **The effect of sodium chloride in improving the permeability of alkali soils.** *Curr. Sci,* 16, 1947 (172-173).

6089. 631.415.3 : 631.67
BONNET, J. A. **Laboratory and field studies in an alkaline earth solonchak area of Puerto Rico to be irrigated.** *Proc. Soil Sci. Soc. Amer. 1946,* 11, 1947 (480-483).

6046. 631.415.7 : 631.416.7
MORIGATTI, J. D. W.; JOHANNESSON, J. K.; BROWNING, A. R. ET AL. **Indicator plants. I. Virginia stock as an indicator of lime availability.** *N.Z. J. Sci. Tech.* 29A, 1947 (58-71).

6174. 631.416.1 : 664.15
BHASKARAN, T. R.; PILLAI, S. C. **Researches on utilization of cane molasses. VI. Loss of biologically fixed nitrogen from soil and the influence of straw on its conservation.** *J. Indian Inst. Sci.* 27A, 1945 (1-5).

6051. 631.416.2 : 631.461
GERRETSEN, F. C. **The influence of microorganisms on the phosphate intake by the plant.** *Plant and Soil* 1, 1948 (51-81). [E.]

6145. 631.416.2 : 631.472
GHANI, M. O.; ALEEM, S. A. **Studies on the distribution of different forms of phosphorus in Indian Soils. II. Vertical distribution.** *Indian J. Agric. Sci.* 13, 1943 (377-381).

6144. 631.416.2 : 631.821.1
GHANI, M. O.; ALEEM, S. A. **Effect of liming on the transformation of phosphorus in acid soils.** *Indian J. Agric. Sci.* 12, 1942 (873-882).

6142. 631.416.327
GHANI, M. O.; HAQUE, A. K. M. F. **Studies on the boron status of some Bengal soils.** *Indian J. Agric. Sci.* 15, 1945 (257-262).

6160. 631.416.4 : 631.414.3
EVANS, C. E.; ATTOE, O. J. **Potassium-supplying power of virgin and cropped soils.** *Soil Sci.* 66, 1948 (323-334).

6162. 631.416.856 : 581.192
STENBERG, M.; EKMAN, P.; LUNDBLAD, K. ET AL. Om kopparhalt i jord och vegetation och resultat av fleråriga gödslingsförsök i koppar. **[The copper content of soil and vegetation and results of long-term fertilizer experiments with copper.]** *Medd. Kgl. LantbrAkad. Vetenskapsavd.* 4, 1949, pp. 106. [Sw.e.]

6080. 631.416.862.1 : 631.414.324
MUKHERJEE, J. N.; CHATTERJEE, B.; BANERJEE, B. M. **Liberation of H^+, Al^{+++} and Fe^{+++} ions from hydrogen clays by neutral salts.** *J. Colloid Sci.* 2, 1947 (247-256).

6116. 631.416.871.1
FUJIMOTO, C. K.; SHERMAN, G. D. **Behaviour of manganese in the soil and the manganese cycle.** *Soil Sci.* 66, 1948 (131-145).

6186. 631.416.871.1 : 631.453
KIPPS, E. H. **The calcium : manganese ratio in relation to the growth of lucerne at Canberra, A.C.T.** *Aust. J. Counc. Sci. Indust. Res.* 20, 1947 (176-189).

6109. 631.416.877 : 619
BARSHAD, I. **Molybdenum content of pasture plants in relation to toxicity to cattle.** *Soil Sci.* 66, 1948 (187-195).

6112. 631.417.4 : 631.58
HOLLEY, K. T.; STACY, S. V.; BLEDSOE, R. P. ET AL. **Effects of cropping systems on yields and the nitrogen and organic carbon in the soil.** *Ga. Expt. Sta. Bull.* 257, 1948, pp. 20.

6152. 631.417.745.4
FORSYTH, W. G. C. **Carbohydrate metabolism in the soil.** *Chem. Indust.* 1948 (515-519).

631.42 TECHNIQUE AND ANALYSIS

6135. 631.422
TINSLEY, J.; PIZER, N. H. **An examination of the Morgan rapid method of soil testing. Part I. The analytical procedures for phosphorus, potassium and calcium.** *J. Soc. Chem. Indust.* 59, 1940 (206-210).

6136. 631.422 : 631.416.4
TINSLEY, J.; PIZER, N. H. **The Morgan rapid method of soil testing. Part III. Use of the Spekker absorptiometer for estimating potassium.** *J. Soc. Chem. Indust.* 64, 1945 (182-187).

6137. 631.423.3 : 631.416.2
TINSLEY, J.; PIZER, N. H. **The Morgan method of soil testing. Part IV. Use of the Spekker absorptiometer for estimating phosphate.** *J. Soc. Chem. Indust.* 65, 1946 (208-211).

6175. 631.423.3 : 631.416.319
COPEMAN, P. R. v. d. R. **Determination of arsenic in contaminated soils.** *S. Africa Dept. Agric. Sci. Bull.* 252, 1946, pp. 5.

6158. 631.423.3 : 631.416.846
MIKKELSEN, D. S.; TOTH, S. J.; PRINCE, A. L. **Determination of magnesium by thiazol yellow method.** *Soil Sci.* 66, 1948 (385-392).

6052. 631.423.3 : 631.811.4
VRIES, O. DE ; BRUIN, P. **Liming problems on light soils in the Netherlands.** *Emp. J. Expt. Agric.* 15, 1947 (260-268).

6171. 631.423.3 : 631.811.4
LUNDBLAD, K. Metoder för bestämning av kalkbehovet hos organogena jordar. **[Methods for estimating the lime requirement of organic soils.]** *Lantbr-Högsk. JordbrFörsöksanst. Medd.* 25, 1948, pp. 30. [Sw.e.]

6111. 631.423.5 : 631.416.722.6
BOWER, C. A.; HUSS, R. B. **Rapid conductometric method for estimating gypsum in soils.** *Soil Sci.* 66, 1948 (199-204).

6085. 631.425
STANGANELLI, M. Sui metodi di analisi meccanica del terreno. **[Methods of mechanical analysis of soil.]** *Sta. Sper. Granicolt. Benito Mussolini Catania, Pub.* No. 5, 1935, pp. 91. [I.]

6110. 631.425.22
BOUYOUCOS, G. J.; MICK, A. H. **A comparison of electric resistance units for making a continuous measurement of soil moisture under field conditions.** *Plant Physiol.* 23, 1948 (532-543).

6107. 631.425.22 : 631.437.31
BOUYOUCOS, G. J.; MICK, A. H. **Improvements in the plaster of Paris absorption block resistance method for measuring soil moisture under field conditions.** *Soil Sci.* 63, 1947 (455-465).

6106. 631.425.22 : 631.437.31
BOUYOUCOS, G. J.; MICK, A. H. **A fabric absorption unit for continuous measurement of soil moisture in the field.** *Soil Sci.* 66, 1948 (217-232).

6079. 631.425.24.005
RICHARDS, L. A. **Porous plate apparatus for measuring moisture retention and transmission by soil.** *Soil Sci.* 66, 1948 (105-110).

6086. 631.425.5
STANGANELLI, M. Sui metodi di analisi meccanica del terreno. Nota II. Preparazione del campione : caso particulare dei terreni umiferi e nuovo metodo generale. **[Methods of mechanical analysis of soils. Note II. Preparation of the sample: particular case of humous soil and a new general method.** *Sta. Sper. Granicolt. Catania Pub.* 11, 1943, pp. 31. [I.]

6087. 631.425.5
STANGANELLI, M. Sui metodi di analisi meccanica del terreno. Nota III : Prove comparative fra i principali apparechi—metodo generale d'analisi. **[Methods of mechanical analysis of soils : Note III. Comparative tests of the principal apparatuses—a general method of analysis.]** *Sta. Sper. Granicolt. Catania Pub.* 12, 1944, pp. 63. [I.]

6140. 631.427.2
SUNDARA RAO, W. V. B.; DESAI, S. V.; REDDY, M. K. **Studies on the methods of estimating total bacterial counts in the soil.** *Indian J. Agric. Sci.* 15, 1945 (111-116).

6066. 631.427.3
CHUBB, W. O.; ATKINSON, H. J. **Plant tissue testing. II. A study of the method of foliar diagnosis.** *Sci. Agric.* 28, 1948 (49-60).

6096. 631.427.3
HALAIS, P. Microdosages rapides de N, P et K par colorimétrie photo-électrique utilisés à Maurice pour le diagnostic foliaire de la canne à sucre. **[Rapid determination of N, P and K by photo-electric colorimetry used in Mauritius for foliar diagnosis of sugar-cane.]** *Rev. Agric. Maurice* 27, 1948 (100-112). [F.]

6065. 631.427.3 : 631.81
ATKINSON, H. J.; PATRY, L. M.; LEVICK, R. **Plant tissue testing. III. Effect of fertilizer applications.** *Sci. Agric.* 28, 1948 (223-228).

631.43 SOIL PHYSICS

6068. 631.43 : 631.874
McVICKAR, M. H.; BATTEN, E. T.; SHULKCUM, E. ET AL. **The effect of cover crops on certain physical and chemical properties of Onslow Fine Sandy Loam.** *Proc. Soil Sci. Soc. Amer. 1946*, 11, 1947 (47-49).

6081. 631.432.2 : 631.43
CHILDS, E. C.; GEORGE, N. C. **Soil geometry and soil-water equilibria.** *Disc. Faraday Soc.* No. 3, 1948 (78-85).

6134. 631.434 : 631.445.7
D'HOORE, J.; FRIPIAT, J. **Structural variations of Yangambi (Belgian Congo) soils.** *Soil Sci.* 66, 1948 (91-104).

6104. 631.435 : 631.412
STANGANELLI, M. Relazioni intercorrenti fra alcune proprietà fisico-meccaniche e fisico-chimiche dei terreni siciliani. [**Some relationships between physico-mechanical and physico-chemical properties of Sicilian soils.**] *Ann. Sper. Agrar. Roma* 2 (n.s.), 1948 (145-165). [I.e.]

6103. 631.436.005
GURR, C. G. **An electrolyte resistance thermometer for measurement of soil temperature.** *Aust. J. Counc. Sci. Indust. Res.* 20, 1947 (500-502).

631.44 SOIL TYPES

6073. 631.445.6
PENDLETON, R. L. **Mediterranean red soils.** *C.R. Conf. Pédol. Méditerr. 1947*, 1948 (157-160). [E.]

6139. 631.445.7 : 631.416.1
JENNY, H.; BINGHAM, F.; PADILLA-SARAVIA, B. **Nitrogen and organic matter contents of equatorial soils of Colombia, South America.** *Soil Sci.* 66, 1948 (173-186).

6061. 631.445.7 : 631.416.8
BIRRELL, K. S.; WRIGHT, A. C. S. **A serpentine soil in New Caledonia.** *N.Z. J. Sci. Tech.* 27A, 1945 (72-76).

6076. 631.445.7 : 631.44
DEMOLON, A.; AUBERT, G.; HÉNIN, S. Tendances actuelles de la pédologie dans les régions tropicales et subtropicales. [**Current trends of pedology in tropical and subtropical regions.**] *C.R.* 227, 1948 (5-8). [F.]

6177. 631.452 : 312
BENNETT, M. K. **Population and food supply : the current scare.** *Sci. Mo.* 68, 1949 (17-26).

631.459 EROSION

6118. 631.459 : 551.41
GARDNER, W. H. **Determination of the critical stream for various slopes.** *Soil Sci.* 66, 1948 (205-215).

6113. 631.459 : 551.511
HOPKINS, E. S.; PALMER, A. E.; CHEPIL, W. S. **Soil drifting control in the Prairie Provinces.** *Canada Dept. Agric. Pub.* 568, *Farm. Bull.* 32, 1937, pp. 51. Fourth Revs. 1946.

631.46 SOIL MICROBIOLOGY

6050. 631.461 : 546.77
MULDER, E. G. **Importance of molybdenum in the nitrogen metabolism of micro-organisms and higher plants.** *Plant and Soil* 1, 1948 (94-119).

6127. 631.461 : 581.144.2
KATZNELSON, H.; LOCHHEAD, A. G.; TIMONIN, M. I. **Soil micro-organisms and the rhizosphere.** *Bot. Rev.* 14, 1948 (543-587).

6058. 631.461.74
LOCHHEAD, A. G. **Chromogenic bacteria related to *Bacterium globiforme*.** *J. Bact.* 55, 1948 (579-580).

6117. 631.462 : 632.953
DALTON, F. H.; HURWITZ, C. **Effect of volatile antiseptics on survival of microflora in soil.** *Soil Sci.* 66, 1948 (233-238).

631.47 LAND CLASSIFICATION, UTILIZATION AND SURVEY

6060. 631.47
GRANGE, L. I. **A basic scheme for land classification.** *N.Z. J. Sci. Tech.* 26A, 1944 (136-141).

6149. 631.47 : 33
JACKS, G. V. **Land utilization, soil conservation and human ecology.** *Roy. Soc. Emp. Sci. Conf. Rept. 1946*, 2, 1948 (272-276).

6069. 631.471
GRIFFITH, A. L.; GUPTA, R. S. **The recording of soil and site characteristics in the field.** *Indian Forest Bull.* 135, 1947, pp.14.

631.48 SOIL FORMATION

6185. 631.48 : 551.4
WOOLDRIDGE, S. W. **Geomorphology and soil science.** *J. Soil Sci.* 1, 1949 (31-34).

6184. 631.48 : 551.5
PRESCOTT, J. A. **A climatic index for the leaching factor in soil formation.** *J. Soil Sci.* 1, 1949 (9-19).

631.5 CULTURAL OPERATIONS

6187. 631.544.7 : 631.416.13
MOOERS, C. A.; WASHKO, J. B.; YOUNG, J. B. **Effects of wheat straw, lespedeza sericea hay, and farmyard manure, as soil mulches, on the conservation of moisture and the production of nitrates.** *Soil Sci.* 66, 1948 (307-315).

6100. 631.557 : 551.58
PAAUW, F. VAN DER Periodiciteit in opbrengsten, vruchtbaarheid van de grond en klimaat. **[Periodicity of crop yields, soil fertility and climate.]** *Landbouwk. Tijdschr.* 60, 1948 (83-92). [Du.e.]

6094. 631.581 : 631.432.2
EVLIYAR, H. Ortaanadolu topraklarinda "Su" ve Ziraat sisteminde "Nadas-Gübre" problemi. **[Water and the fallow-manure problem in Central Anatolia.]** *Ziraat Dergisi* 9, 1948 (3-13). [Tu.]

631.8 FERTILIZERS AND MANURES

6093. 631.811
HALLIDAY, D. J. **A guide to the uptake of plant nutrients by farm crops.** *Jealott's Hill Res. Sta. Bull.* 7, 1948, pp. 34.

6088. 631.821.1 : 631.416
BONNET, J. A. **Tracing the calcium, phosphorus and iron from a limed and unlimed lateritic soil to the grass and to the animal blood.** *Proc. Soil Sci. Soc. Amer. 1946*, 11, 1947 (295-297).

6075. 631.84
BALLS, W. L.; GRACIE, D. S.; KHALIL, F. **Evaluating the effect of nitrogenous fertilizers by combining statistical and agronomic data.** *Min. Agric. Egypt Chem. Sect. Bull.* 249, 1948, pp. 35.

6138. 631.841.5
CHEN, C. T.; CHANG, J. M.; WEI, C. T. **A study on the application of calcium cynamide to soils.** *J. Soc. Chim. Trop. Agric.* 1, 1948 (36-51).

6059. 631.85 : 631.414.324
DIXON, J. K.; TAYLOR, N. H. **Losses of exchangeable potash and magnesia contents from Waikato soils following continued phosphate top-dressing.** *N.Z. J. Sci. Tech.* 24, 1942 (146A-151A).

6141. 631.85 : 631.815
DAS, S. **Relative availabilities of different natural and artificial phosphates in calcareous soils.** *Indian J. Agric. Sci.* 15, 1945 (130-135).

6056. 631.851 : 631.855
HALL, T. D.; MEREDITH, D. **Field evaluation of Langebaan rock phosphate.** *S. Afric. J. Sci.* 42, 1946 (101-104).

6090. 631.874 : 633.3-1.81
BONNET, J. A.; TELFORD, E. A.; MARIOTA, F. ET AL. **Effect of lime and phosphorus on the yield of four Leguminosae in two acid soils of Puerto Rico.** *J. Agric. Univ. P.R.* 29, No. 2, 1945 (47-56). [E.sp.]

6151. 631.875 : 631.461.74
WEBLEY, D. M. **The microbiology of composting. The behaviour of the aerobic mesophilic bacterial flora of composts and its relation to other changes taking place during composting.** *Proc. Soc. Appl. Bact.* 1947 (83-89).

6146. 631.876.9 : 631.63
SRIVASTAVA, R. C.; RAO, K. A. N.; GUPTA, G. N. **Utilization of waste products of the sugar industry in the cane fields. II. Preparation of composts by hot fermentation.** *Indian J. Agric. Sci.* 12, 1942 (848-850).

6067. 631.877
SOWDEN, F. J.; ATKINSON, H. J. **Waste sulphite liquor solids as a soil treatment.** *Sci. Agric.* 28, 1948 (175-182).

6170. 631.878
PLAUT, M.; HURWITZ, S. **Organic substitutes for animal manure. I. Huminal.** *Rehovot Agric. Res. Sta. Bull.* 46, 1948, pp. 35.

6157. 631.878 : 631.879.1
HUDIG, J.; REESEMA, N. H. S. VAN Het probleem van de stabiliteit der humusstoffen. [**The stability of humus material. I.**] *Landbouwk. Tijdschr.* 52, 1940 (371-398, 529-634). [Du.]

6173. 631.879.2
MINISTRY OF AGRICULTURE. **The agricultural use of sewage sludge and sludge composts.** *Min. Agric. Tech. Commun.* 7, 1948, pp. 18.

632 PLANT DISEASES AND PROTECTION

6161. 632.765 : 633.61
MCDOUGALL, W. A. **Investigations on the control of wireworms (*Lacon variabilis* Cand.) in canefields with "Gammexane."** *Queensland J. Agric. Sci.* 4, 1947 (140-150).

6071. 632.953 : 547.414.8
STARK, F. L., JR. **Investigations of chloropicrin as a soil fumigant.** *Cornell Agric. Expt. Sta. Mem.* 278, 1948, pp. 61.

6163. 632.954 :577.15.04
MEADLY, G. R. W. **Recent trials with selective weed killers.** *J. Dept. Agric. W. Aust.* 24, 1947 (55-63).

6098. 632.954 : 577.17
AKAMINE, E. K. **Plant-growth regulators as selective herbicides.** *Hawaii Agric. Expt. Sta. Circ.* 26, 1948, pp. 43.

633.1 CEREALS

6095. 633.1-1.84
HALLIDAY, D. J. **Nitrogen for cereals. The response of cereals to increasing rates of nitrogen fertilization.** *Jealott's Hill Res. Sta. Bull.* 6, 1948, pp. 38.

6166. 633.1-2.19-1.811
HEDLUND, T. Om stråsädens näringsupptagande med särskild hänsyn till gråfläcksjukans orsak. [**The nutrient uptake of straw crops with special reference to the cause of greyspeck disease.**] *Uppsala* 1948, pp. 91.

6164. 633.11 : 546.56 : 546.47
DUNNE, T. C.; THROSSELL, G. L. **Responses of wheat to copper and zinc at Dongara.** *J. Dept. Agric. W. Aust.* 25, 1948 (43-46).

6119. 633.14 : 636.084.22
SIMS, H. J. **Ryecorn—a cereal for winter grazing and drift control in the Mallee.** *J. Dept. Agric. Victoria* 42, 1944 (151-154, 162).

6143. 633.18-1.547.2
RHIND, D.; THEIN, U BA ; TIN, U. **Growth and yield studies on irrigated paddy in Upper Burma.** *Indian J. Agric. Sci.* 13, 1943 (335-348).

6189B. 633.18-1.81
CHANG, S. C.; LIN, J. F.; PUH, Y. S. [**The effect of continuous application of the same fertilizer on the yield of rice and the physical and chemical properties of soil.**] *Taiwan Agric. Res. Inst. Tech. Bull.* 3, 1947 (18-43). [Ch.e.]

6189A. 633.18-1.81
CHEN, C. T.; LIN, J. F. **[A discussion on the results of thirty years' experiment of growing rice without applying fertilizer.]** *Taiwan Agric. Res. Inst. Tech. Bull.* 3, 1947 (1-17). [Ch.e.]

6043. 633.19-1.557 : 551.577
ARAKERI, H. R. **The influence of rainfall during the different growth phases on the yield of *Bajri* in Poona for fourteen years.** *Indian Ecol.* 2, 1947, pp. 6.

633.2 GRASSES

6091. 633.2.03-1.5 : 581.144.2
WEINMANN, H. **Underground development and reserves of grasses. A review.** *J. Brit. Grassland Soc.* 3, 1948 (115-140).

6092. 633.2.03-1.81 : 581.144.2
WEINMANN, H. **Investigations on the underground reserves of South African grasses.** *S. African Sci.* 2, 1948 (12-15).

6188. 633.2.03-1.81 : 581.192
ØDELIEN, M. Orienterende forsøk med store kunstgjødselmengder til eng på Østlandet. **[Preliminary experiments with heavy applications of artificial fertilizers to temporary hay in south-east Norway.]** *Meld. Norg. LandbrHøgsk.* 27, 1947 (85-154). [N.e.]

6082. 633.2.03-1.81 : 636.084.22 : 581.192
WEINMANN, H. **Effects of grazing intensity and fertilizer treatment on Transvaal high-veld.** *Emp. J. Expt. Agric.* 16, 1948 (111-118).

6055. 633.2.03-1.84 : 581.192
HALL, T. D.; MEREDITH, D.; MURRAY, S. M. **Dry matter and protein of pastures as affected by amounts and forms of nitrogen applied.** *S. Afric. J. Sci.* 44, 1948 (111-118).

633.3 LEGUMES

6179. 633.3-1.811.9
RICEMAN, D. S. **Mineral deficiency in plants on the soils of the Ninety-mile Plain in South Australia. 2. Effect of zinc, copper and phosphate on subterranean clover and lucerne grown on Laffer sand, near Keith.** *Aust. Counc. Sci. Indust. Res. Bull.* 234, 1948, pp. 45.

6155. 633.31 : 546.27
NAFTEL, J. A. **Alfalfa—a crop to utilize the South's resources.** *Better Crops with Plant Food* 30, No. 10, 1946 (14-16, 42).

633.4 ROOT CROPS

6101. 633.491-1.415.1 : 581.144.2
GOEDEWAAGEN, M. A. J.; WILLIGEN, A. H. A. DE Over de bewortelíng van verschillende aardappelrassen en de invloed, die de zuurgraad van de grond daarop uitoefent. **[On the root development of different potato varieties and its relation to the acidity of the soil.]** *Landbouwk. Tijdschr.* 59, 1947 (504-510). [Du.e.]

633.5 FIBRE PLANTS

6148. 633.51-2.19-1.811.1
DASTUR, R. H.; SINGH, M.; SINGH, S. **Studies in the periodic partial failures of the Punjab-American cottons in the Punjab. XII. Further experiments on the amelioration of *tirak*.** *Indian J. Agric. Sci.* 14, 1944 (181-195).

6102. 633.52-1.4-2.112 : 581.192
RAESIDE, J. D.; MASON, R. **Linen-flax-fibre quality in relation to soil types.** *N.Z. J. Sci. Tech.* 28A, 1946 (44-69).

633.6 SUGAR CROPS

6077. 633.61-1.84-1.816
ROSENFELD, A. H. **Manurial requirements of sugar cane in Egypt. III. Further rate of nitrogen experiments.** *Egypt Min. Agric. Bull.* 203, 1939, pp. 24.

6078. 633.61-1.85
ROSENFELD, A. H. **Manurial requirements of sugar cane in Egypt. IV. Further phosphate experiments.** *Egypt Min. Agric. Bull.* 210, 1939, pp. 25.

6097. 633.63-1.427.3
HALAIS, P. **Foliar diagnosis : a comparative index of the mode of nutrition of sugar cane.** *Rev. Agric. Maurice* 27, 1948 (122-125). [F.]

633.7 STIMULANTS

6105. 633.71-1.531
McEvoy, E. T. **Construction and management of tobacco seed-beds.** *Canada Dept. Agric. Pub.* 806, 1948, pp. 25.

6063. 633.71-1.81 : 581.192
Askew, H. O.; Blick, R. T. J.; Watson, J. **The effect of fertilizers and their manner of application on chemical composition of flue-cured tobacco.** *N.Z. J. Sci. Tech.* 29A, 1947 (5-17).

6048. 633.73-1.81
Mayne, W. W. **A note on coffee research in South India.** *Indian Coffee Bd., Bangalore,* 1946, pp. 72.

634 ORCHARDS, FRUIT

6049. 634.22-1.4
Garner, R. J.; Hatcher, E. S. J. **Spacing as a factor governing rooting and growth of hardwood cuttings of the Myrobalan B plum rootstock.** *J. Pomol.* 23, 1947 (149-166).

6074. 634.25-2-1.432
Fikry, A. **Water-table effects. V. Peach functional disorder.** *Egypt Min. Agric. Plant Path. Sect. Bull.* 245, 1947, pp. 42.

6114. 634.75-2.4-1.461 : 581.144.2
Katznelson, H.; Richardson, L. T. **Rhizosphere studies and associated microbiological phenomena in relation to strawberry root rot.** *Sci. Agric.* 28, 1948 (293-308).

6178. 634.973.825-1.4
Griffith, A. L.; Gupta, R. S. **The determination of the characteristics of soil suitable for sal *(Shorea robusta)*.** *Indian Forest Rec. Silvic. Bull.* 138, 1948, pp. 27.

GEOGRAPHICAL

6182. (492)631.4
Maschhaupt, J. G. Bodemkundige onderzoekingen in het Dollardgebied. **[Soil investigations in the Dollard area.]** *Versl. Landbouwk. Onderzoek.* 54, No. 4, 1948 pp. 222. [Du.e.]

6176. (492)631.47
Liere, W. J. van De bodemkartering van Nederland. II. De bodemgesteldheid van het Westland. **[Soil survey of Holland. II. Soil conditions in the Westland.]** *Versl. Landbouwk. Onderzoek.* 54, No. 6, 1948, pp. 149. + 10 maps. [Du.e.]

6156. (492)631.473
Pijls, F. W. G. De bodemkartering van Nederland. I. Een gedetailleerde bodemkartering van de gemeente Didam. **[Soil survey of Holland. I. A detailed soil survey of the Didam community.]** *Versl. Landbouwk. Onderzoek.* No. 54, 1948 (1-116). [Du.e.]

6099. (492)631.811.4 : 631.557
Castenmiller, G. M. De betekenis van de kalktoestand van het Nederlandse bouwland voor de toekomstige productiemogelykheden van de akkerbouw. **[Increasing the production of arable land in the Netherlands by improving the lime status of the soil.]** *Landbouwk. Tijdschr.* 60, 1948 (92-106). [Du.e.]

6072. (51)55
Li, H.- F. **Bibliography of Chinese geology. Bibliography of geology and geography of Sinkiang.** *Nat. Geol. Surv. China,* 1947, pp. 213.

6070. (54)631.459
Gorrie, R. M. **Countering desiccation in the Punjab.** *Geog. Rev.* 38, 1948 (30-40).

6168. (569)631.411.4
Ravikovitch, S. **Peat soils and soils rich in organic matter in the Huleh valley.** *Agric. Res. Sta., Rehovot Bull.* 47, 1948, pp. 32.

6169. (569)631.411.4
Samisch, R. M. **Plum growing in the Jewish settlement of Palestine.** *Agric. Res. Sta., Rehovot Bull.* 50, 1948, pp. 82.

6159. (64)631.4 : 631.67
Bryssine, G. Étude préliminaire des sols du périmètre irrigable des Srarhna. **[A preliminary study of the soils of the irrigable perimeter of Srarhna.]** *Serv. Rech. Agron. Expt. Agric. Rabat* 1948. Pp.52, 3 maps, 6 plates.

6181. (65)631.4
AUBERT, G; MONJAUZE, A. Observations sur quelques sols de l'Oranie Nord-Occidentale—Influence du Déboisement, de l'Erosion, sur leur évolution. [**Observations on some soils of North-West Oran—effect of deforestation and erosion on their evolution.**] *C.R. Soc. Biogéog.* 23, No. 199, 1946 (44-51). [F.]

6190. (669)631.4
VINE, H. **The soil resources for increased production.** *Farm and Forest* 9, 1948 (21-27)

6167. (678)631.47 : 581.5
GILLMAN, C. **A vegetation-types map of Tanganyika Territory.** *Geog. Rev.* 39, 1949 (7-37).

6045. (68.01)633.2.03
MEREDITH, D. **Towards a national pastoral policy.** *S. Afric. J. Sci.* 40, 1943 (37-56).

6044. (68.01)635.964-1.81
HALL, T. D.; MEREDITH, D.; MURRAY, S. M. **Turf research in South Africa.** *S. Afric. Golf*, Jan. 20, 1946, pp. 4.

6084. (81)633.73-1.445.7
SETZER, J. O problema dos cafezais novos em terras roxas cansadas. [**The problem of new coffee plantations on exhausted purple-red earths.**] *Bol. Curs. Aperf. Espec.* 3, 1944, pp. 72. [Pt.e.]

6057. (86)631.44
JENNY, H. **Great soil groups in the equatorial regions of Colombia, South America.** *Soil Sci.* 66, 1948 (5-28).

6062. (931)631.459
EDIE, E. G.; SEELYE, C. J.; RAESIDE, J. D. **Notes on the Canterbury floods of February, 1945.** *N.Z. J. Sci. Tech.* 27B, 1946 (406-420).

6047. (931)631.459
RAESIDE, J. D.; BAUMGART, I. L. **Erosion on the downlands of Geraldine County, South Canterbury.** *N.Z. J. Sci. Tech.* 29A, 1947 (49-57).

6172. (941)631.445.73 : 631.48
SMITH, R. **A relationship between soils and topography in South Western Australia.** *J. Aust. Inst. Agric. Sci.* 14, 1948 (15-17).

6133. (941)631.459 : 631.61: 34
WISE, F. J. S. **The importance of soil conservation.** *Government Printer, Perth*, 1945, pp.11.

6165. (941)633.1-2.191 : 546.56
DUNNE, T. C. **Copper deficiency of cereal crops in Western Australia.** *J. Dept. Agric. W. Aust.* 25, 1948 (76-81).

6128. (942)631.459 : 631.47
HERRIOT, R. I. **The district approach to soil conservation. A commentary on recent legislation.** *J. Dept. Agric. S. Aust.* 49, 1946 (379-381).

6129. (942)631.459 : 631.47
HERRIOT, R. I. **Soil conservation districts. Murray Mallee District proclaimed.** *S. Aust. Dept. Agric. Leaflet* 10/47, 1947, pp.3.

6130. (942)631.459 : 631.61 : 34
HERRIOT, R. I. **The soil conservation act and what it means.** *S. Aust. Dept. Agric. Leaflet* 5/45, 1945, pp. 3.

6120. (945)631.459 : 551.55 : 631.61
HORE, H. L. **Soil drift and control measures.** *J. Dept. Agric. Victoria* 43, 1945 (233-240, 263-266).

6126. (945)631.459 : 631.61
MCNAB, R. F. **Some facts concerning soil building and erosion control.** *Victoria Soil Conserv. Bd. Leaflet* 3, 1943, pp. 11.

6125. (945)631.459 : 631.613
VICTORIA SOIL CONSERVATION BOARD. **Contour furrowing to control run-off of water.** *Victoria Soil Conserv. Bd. Leaflet* 1, 1946, pp. 6.

6064. (961)631.4
OJALA, E. M. **Grassland plains soil of Guadalcanal, British Solomon Islands.** *N.Z. J. Sci. Tech.* 29A, 1947 (18-21).

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